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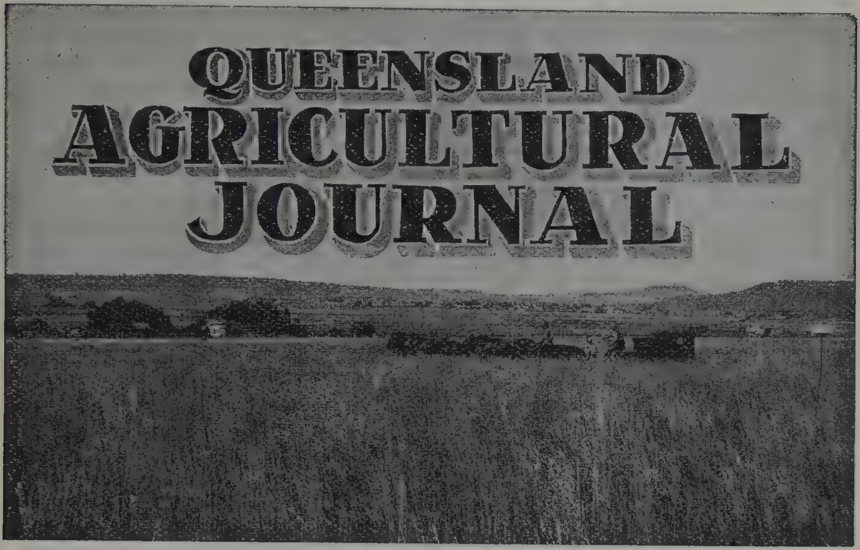

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Event and Comment.

The New Year in Agriculture.

1936 should be an extraordinarily interesting year in Queensland Agriculture. Apart from our normal cropping programmes, the success of which depends so largely on seasonal circumstances, we shall see the expansion of a policy that, it is believed, will have a definite beneficial influence on the future of agriculture in this country. We shall see new developments in agricultural research for the purpose of increasing efficiency, quality, and stability of crop production and disposal. We shall see the tackling of many perplexing problems with which primary industry is faced in this State—problems, many of them, common to agriculture the world over. The investigation of those problems—and, let us hope, their solution—calls for the co-operation of our best brains.

Research is the Agricultural Department's biggest job. It cannot help farmers to plan their production, to reduce their costs, to fight vegetable and animal diseases and pests, to produce better crops and live stock, to market their products efficiently without first studying how these things may be done. The Department has, accordingly, strengthened its scientific staffs and extended its scientific services. A new Research Bureau will commence to function early in the New Year; the Bureau of Tropical Agriculture, established recently at South Johnstone, will commence its planned field programme; the Dairy Research Laboratory, now fully staffed and equipped, will enter on new and important phases of its work; while the Marketing Branch of the Department, which may be regarded as the foundation of a future Bureau of Agricultural Economics, will intensify its activities towards the attainment of a balanced rural industry in Queensland.

In our progress towards general social betterment we need more science, particularly in agriculture which, when all is said and done, is the basis of all our activities. Science, after all, is merely organised knowledge. The science of production is familiar to most of us, but it is not of much value unless the goods we produce can be distributed. The need arises, therefore, of studying primary factors in successful farming—marketing, consumption, interstate and international trade, movements of population, and commodity prices. The main business of agriculture is food production, and food consumption is limited, of course, by the capacity of our collective stomach. Technical progress in distribution is just as essential as the production of wealth. Standardisation and grading are not only for the purpose of protecting the consumer, but should also make it possible for farmers to get higher prices for products of better quality.

The most important and most difficult problem in marketing is in bringing about changes in our present methods, practices, and facilities in order to promote efficiency and lower selling costs. Any reorganisation of marketing methods and facilities requires very careful study in order to find a practical way of cutting out costly methods and unnecessary services. That will be one of the jobs of the economist in the coming year.

The regulation of methods and practices—for the purposes of directing rather than regimenting the producer—as provided for in our existing legislation will, presumably, be another subject for study in 1936; and it is obvious that research and educational work are necessary in order to indicate how practical improvements in marketing can be made. Improved marketing and better education can also go a long way towards increasing the consumption of certain foods. Recent surveys have shown, for instance, that in our cities there is a widespread under-consumption of milk and vegetables. To a great extent this under-consumption can be remedied by better marketing and distribution.

For the dairy farmer, the Dairy Research Laboratory should be of special value in the coming year. Dairying actually is the most complex of our rural industries, for it is not a single industry but a group of related industries of vast economic and social importance to Queensland, the only country in the world, by the way, that is dairying successfully and on a large commercial scale within the tropics. Obviously research work is of enormous value to the industry in all its branches. In the course of the year just beginning, greater attention will, no doubt, be given to the advantages of selecting breeding animals for both milk and meat production.

The increased interest now taken in our indigenous and introduced grasses by farmers as well as graziers is clear evidence of a broader appreciation of the value of grass in our rural economy—a "grass consciousness," so to speak. This is as it should be, for Queensland is remarkably rich in the number and nutritive value of its native grasses. About 450 have been classified, and a strong characteristic of many of them is their drought resistance. We are now thinking of grass in comparison with other field crops and it is not hard to foresee that the attention given to the annual fodder crop will be extended to the permanent pasture in general agricultural practice. That that should be so is plain in the light of the fact that at least 70 per cent. of our national income is derived from our grasslands. Grass is, therefore, the most important crop in the whole range of the State's production. In our grasslands—particularly the Mitchell and Flinders grass country of the West—we have a wonderful asset and a great inheritance. Our job—and this is part of the research programme for this year—is to preserve that inheritance by preventing that asset from vanishing through any misuse or abuse of grazing lands, whether through lack of intelligent pasture management, wantoness, or sheer greed. These problems are often, unfortunately, questions of human nature rather than of economics. Grass is the best and cheapest stock food, and yet through human perversity it is the most abused. No country can make progress on worn-out pastures.

Man's maltreatment of the soil or of its natural forest and grass cover is a cause of increasingly destructive erosion by wind and water. That is another of the research jobs for the coming year, and in regard to which we have not yet realised fully the high cost of doing nothing. Studies conducted recently by the Forest Service in California produced evidence that vegetation not only obstructs and retards the run-off of surface water, but also by means of leaf litter and the action of roots keeps the top soil so porous that a large proportion of rain water percolates continuously into the soil to increase underground supplies. Litter-covered soil was found to absorb five to ten times as much water as that absorbed by bare soil. Run-off was just the reverse—ten to thirty times as great from bare soil as from litter covered soil. Generally from a hundred to a thousand times more soil was swept away from bare soil plots than was eroded from forest-covered plots and, under ordinary field conditions, it was found that heavy rain falling at an hourly rate of an inch upwards, even though of brief duration, quickly puddled the surface soil, sealed the soil pores and started a rapid process of gully erosion.

The loss of soil through wind erosion is tremendous, as every observer on the land knows. A well-authenticated case is reported from Ukraine, where 700 widely distributed measurements of a violent dust storm were taken, and they showed that a total of 15,400,000,000 tons of soil had been swept up into the air and deposited in other parts of the country as well as in Poland and Roumania. This type of soil denudation, just as in the case of sheet and gully erosion by water, is a usual consequence of unwise use of land. Nature, however, has pointed the way to recovery. The dominant influence of vegetation—whether it be windbreaks of forest trees, grass, close-growing cover crop or shrubs—as a controlling factor stands out as an impressive fact. A combination of the vegetable factor with mechanical control—terracing contour cultivation and sod banks where gully erosion is threatened—are among the most practicable means of preventing the loss of surface soil from farm lands.

The Minister's New Year Message

WITH the opening of the New Year, I look forward to another period of sustained progress. The past year has been one of expanding activity as several new undertakings of vital concern to farming and pastoral interests have been successfully launched. Chief amongst these are the establishment of a Dairy Research Laboratory and specialised nutritional and disease research in the pastoral industries.

The Department is an essential part in the life of the farming community and is always prepared to give service in the cause of farming. We have highly trained officers whose life work is the advancement of one or other of the many matters associated with farming. Our degree of usefulness, however, is measured by the degree of co-operation we succeed in obtaining from the primary producer of the State. Unless you acquaint us with your problems, we are frequently unaware of their existence.

Might I suggest, therefore, that the coming year be made outstanding on account of the number of new contacts we make and the expanding service we are able to give in consequence.

On behalf of all officers of the Department, I wish all our primary producers a good season and a series of successful operations.

Frank. W. Bulcock

Diseases of the Tomato.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

THE tomato is subject to a number of diseases which demand special attention from the grower if a healthy crop is to be obtained. The two most important maladies in this State are Irish blight during the cooler months and Fusarium wilt in the summer. The individual diseases are first dealt with separately, followed by a summary of the precautions it is necessary to take for their control. It will be noticed that a number of the diseases of the tomato occur also on the potato. This is not surprising since the two plants are closely related botanically.

IRISH BLIGHT.

Irish blight (Plate 1) is so called since it first came under special notice in Ireland where, as a serious disease of the potato crop, it was an important cause of the Irish famine in the middle of last century. The disease is now widespread throughout the world, and attacks the tomato as well as the potato.

The first symptoms to appear are dark brown patches on the leaves or an elongated dark area on the stem. If the weather is wet these areas will assume the appearance of a wet rot and enlarge rapidly. If it is sunny, they will remain in a dry papery condition until wet weather again allows them to extend and further spots to develop. A heavy fall of dew may be sufficient to allow a temporary increase. Eventually the whole plant may become blighted and die.

Fruit infection is an even more serious proposition since tomatoes may be packed in an apparently sound condition and develop in the market later the large mottled brown area of decay which is characteristic of the disease.

Irish blight is caused by a fungus (*Phytophthora infestans*), the delicate threads of which ramify within the tissue of the plant, bringing about the death and decay of the part invaded. Under moist conditions the fungus comes to the surface and forms enormous numbers of minute spores which may be seen in mass as a white down over the lower surface of the spots. It is these spores which spread the disease. They are very delicate and need an abundance of moisture to enable them to live and germinate—so forming fresh spots. The fungus also requires a relatively cool temperature for its development, hence, if wet weather is experienced during the winter and spring, the crops growing at this time will be seriously affected. Later crops are usually free from the disease.

Control.

The disease can be controlled by spraying with Bordeaux mixture. Spraying should commence in the seed-bed, using a 2·3·40 mixture and be continued in the field with a 4·4·40 strength as soon as the plants have become established. Spray thoroughly and sufficiently often to keep the whole of the plant, both upper and lower leaf surfaces, covered. During wet weather this may have to be done every few days. When the plants are large and bushy, a copper sulphate-lime dust applied frequently under good dusting conditions may have some advantage over the wet spray, but this is not recommended for small or staked plants.

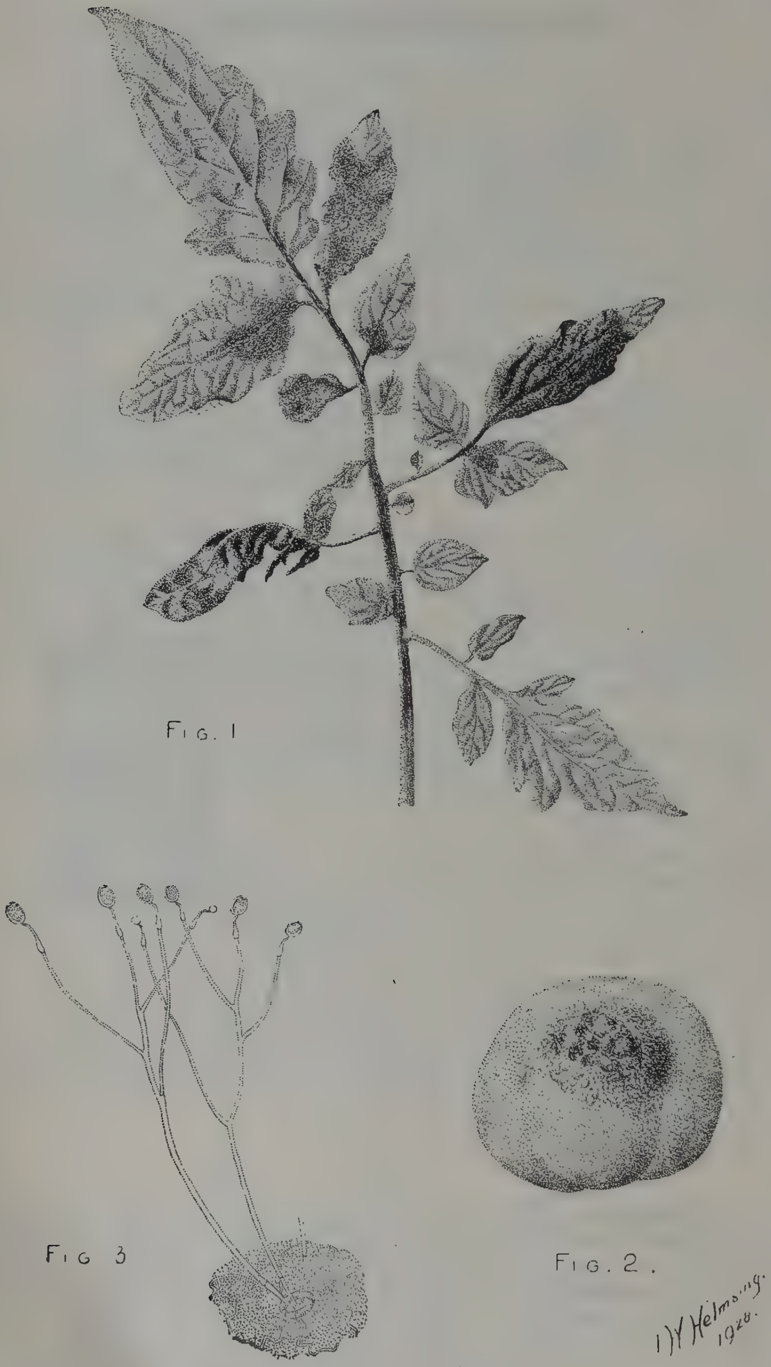
FIG. 1
FIG 3
FIG. 2.
D W Helmsing 1928.

PLATE 1.
IRISH BLIGHT OF THE TOMATO.
Fig. 1, Foliage symptoms. Fig. 2, Fruit rot. Fig. 3, Fruiting stage of the causal organism (*Phytophthora infestans*), highly magnified.

Burgundy mixture may be substituted for Bordeaux if desired.

Clean up and burn the remains of all tomato plants at the end of the season.

SEPTORIA LEAF SPOT.

Small circular grey spots about $\frac{1}{8}$ inch in diameter appear scattered over the lower leaves of the plant. The centre of the spot is somewhat lighter in colour and is characterised by the presence of a number of minute black points. (Plate 2; fig. C.) These latter are the tops of minute flask-shaped spore receptacles belonging to the fungus *Septoria lycopersici*, the cause of the disease. A yellowing of the leaf takes place round the spots and gradually spreads until the leaf dries out and withers. The lower leaves are gradually killed from the bottom up, and a scalding of the fruit by the sun may result. The disease is most serious in the warmer months.

Control.

(1) Spray in the seed-bed and the field with Bordeaux mixture as recommended for Irish blight.

(2) Collect and burn all tomato refuse as soon as the crop is off.

TARGET SPOT.

The general effect of this disease on the plant is similar to Septoria leaf spot, but the spots are as a rule larger, $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, and are often marked by concentric rings. It is these markings which give the disease its name. They are formed as a result of the somewhat intermittent growth of the fungus (*Alternaria solani*) within the tissue. Affected leaves gradually turn yellow and dry out, the plant becoming defoliated from the base up. Other less common symptoms produced by this organism consist of a black spot on the fruit, usually commencing near the stalk, and a brown shrunken area at the base of seedlings which may eventually cincture the stem and cause their death.

Other species of *Alternaria* are also associated with a fruit decay following wound infection (Plate 2; fig. B). The dark spot first formed often becomes covered with a greenish black felt-like mound of mould growth of characteristic appearance.

Control.

The control of target spot is similar to that of Septoria leaf spot, and the precautions recommended for the one are satisfactory for the other.

WILTS.

There are at least four different wilt diseases affecting tomatoes in Queensland. These consist of a bacterial wilt caused by *Bacterium solanacearum,* two fungus wilts due to *Fusarium lycopersici* and *Verticillium alboatrum,* and the virus disease, spotted wilt. The lastnamed will be dealt with separately under the heading of virus diseases.

In the first three diseases mentioned the typical symptom is a drooping of the foliage from the ends of the branches, followed by the collapse of the plant in a general wilt. In the case of *Fusarium,* the actual wilting may be delayed or may even never eventuate. In this case a characteristic yellowing of the lower leaves takes place and these die progressively from the base of the plant upwards.

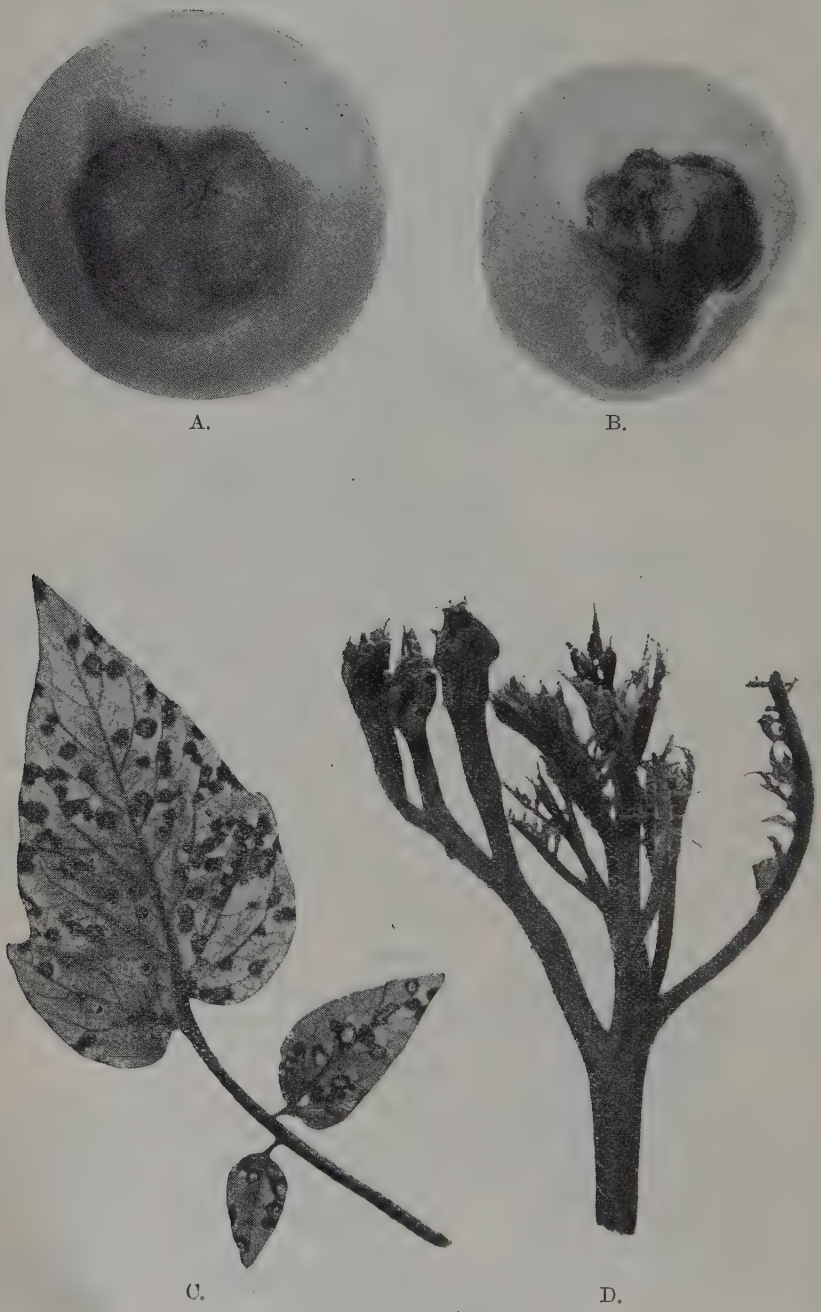

PLATE 2.—TOMATO DISEASES.

A. Blossom end rot. B. Alternaria rot following infection through a crack near the stem scar. C. Septoria leaf spot. Note the fruiting bodies showing as black points. D. Big bud.

When the base of the stem is cut across, or the bark removed, the large, woody, water-conducting vessels are seen to be discoloured brown. If a slimy bacterial ooze issues from the cut ends of these then the disease is diagnosed as bacterial wilt. Verticillium and Fusarium wilt have the same browning of the vessels in the stem but the bacterial slime is absent. It is difficult to distinguish between these two without isolating the fungus which is present. Verticillium wilt occurs during the cooler months. Fusarium wilt is by far the most common of all the wilt diseases and is most prevalent in the warmer weather.

The symptoms described above are brought about by the invasion of the vessels of the stem by one of the parasites mentioned. Its presence causes the vessels to cease their normal function of water and food conduction and turn brown. Entrance is obtained in the first place through injured roots. The fungus *Fusarium* in particular can live for many years on organic matter in the soil, and from there attack a tomato plant when one becomes available. Varieties of tomato vary in their degree of susceptibility to the attack of this organism.

Control.

(1) Remove diseased plants and destroy the remains of the crop by burning after harvesting is completed.

(2) Where possible allow at least a three-year interval between crops of tomatoes on the same land.

(3) Sterilize seed by immersion for five minutes in a solution consisting of 1 part of corrosive sublimate in 3,000 parts of water. The seed should then be rinsed well in clean water and sown as soon as possible.

(4) Use only virgin or sterilized soil for the seed-bed, which should not be made near the site of previous tomato crops.

(5) Attempt to find a resistant variety suited to the district, and if successful use this for planting on infected land. Varieties which exhibit resistance to Fusarium wilt are Bowen Buckeye, Break o' Day, Denisonia, Globe, Marglobe, Norton, Ponderosa, Pritchard. These vary in general suitability and wilt resistance in different districts, and the grower will therefore have to make his own selection.

VIRUS DISEASES.

The virus diseases of the tomato differ from those already dealt with in their mode of origin. They are brought about by the presence within the cell sap of affected plants of a minute infectious agent or virus. The virus is so minute that it cannot be distinguished even by a high powered microscope. These diseases are spread by transferring virus-infected sap from a diseased to a healthy plant. In some instances, such as with mosaic, this may be done mechanically by means of the hands or pruning knives. In other cases sucking insects such as aphids or thrips are responsible for transmitting the disease. Usually an incubation period of ten days or more follows the inoculation before the typical symptoms are evident.

At least four different virus diseases occur in Queensland. These are mosaic, spotted wilt, big bud, and streak.

Mosaic.

This disease of the tomato is identical with the disease of the same name on tobacco and potato and is intertransmissible with these hosts. Affected plants are distinguishable by a lighter green colour and slightly crinkled condition of the foliage. Closer examination shows the leaves to be mottled with indefinite light and dark green areas. The fruit are not affected, and unless the plants are infected early in life the loss from mosaic is not serious. Mosaic is extremely infectious and is readily spread by the hands, pruning knives, or aphids.

Spotted Wilt.

This disease is sometimes known as bronzy wilt from the fact that the young shoots of an infected plant develop a dark reddish-brown or bronzed appearance. This is due to a more or less close aggregation of circular brown spots of ⅛ inch or so in diameter. Other symptoms are a cessation of active growth and a bending back of the leaf stalk and incurving of the blade of the leaflets. These last give a drooping appearance to the plant. The bronzed leaves wither and dry up. Fruit from affected plants occasionally have bronzed markings or a blotched yellow and green appearance of the skin.

Spotted wilt is spread by a minute insect, the black carnation thrips (*Frankliniella insularis*), while feeding. The virus is not normally carried mechanically.

Big Bud.

This disease (Plate 2; fig. D) is common in some of the more northern districts where it is sometimes known as blue top. It is characterised by either a bunched or attenuated terminal growth. In either case there is a definite swelling of the leaf and flower stalks, an enlargement and abnormal development of the floral parts and a reduction in size but increase in the number of leafy structures. A bunched and tufted type of growth with a distinct purplish colouration is the final condition. The fruit remains small and hard with thickened and irregular septa. Big bud can be transmitted by grafting a diseased on to a healthy plant. In the field it is no doubt spread by the agency of some sucking insect but which one is not yet known.

Streak.

This is the least common of the virus diseases and little is known regarding its peculiarities in this State. The characteristic feature is the development of elongated, slightly sunken, greyish-black streaks or spots up and down the stem. Black lines on the leaf and brown irregular markings over the surface of the fruit also occur.

Control.

The control of these maladies is based on the characteristic behaviour of virus diseases which has been briefly outlined above.

(1) Make the seed-bed on virgin or sterilized soil.

(2) Remove all weed growth from the vicinity for some time prior to planting, as wild hosts may be present amongst the weeds.

(3) Make frequent inspections while the plants are young and remove and burn any abnormal plants in order to avoid having them act as a source of the virus.

(4) Always wash the hands or pruning knives in soap and water after touching diseased plants.

(5) Add nicotine sulphate to the Bordeaux spray in order to keep aphids and thrips in check.

(6) Clean up and burn the remains of the crop as soon as it has ceased to be profitable and eradicate volunteer tomato and potato plants or Solanaceous weeds which are likely to carry on the disease until next season.

(7) Avoid excessive use of nitrogenous manures which appear to make the plant more susceptible to some of the virus diseases.

BLOSSOM END ROT.

In blossom end rot (Plate 2; fig. A) a light brown circular area forms at the apex or blossom end of the green developing fruit. The tissue of the discoloured region is firm and may be shrunken to form a slight depression. There is no soft rot.

This trouble is a physiological one and is not due to the presence of a parasite. It appears to be brought about when the plant is subjected to an erratic water supply, such as occurs when periods of heavy rain are followed by hot dry weather. Under these conditions the foliage may withdraw water from the fruit, causing a collapse of the cells at the apex.

The control of this disease is to some extent outside the power of the grower. However, he can help to provide an even supply of moisture throughout the growth of the crop by means of good cultivation, and, where possible, irrigation. Avoid excessive applications of nitrogenous manures. Build up the humus content of the soil where necessary.

Summary of Measures to be Included in the Cultural Programme for Controlling Tomato Diseases.

(1) Use virgin or sterilized soil for the seed-bed.

(2) Sterilize the seed in 1 in 3,000 corrosive sublimate for five minutes.

(3) Spray the seed-bed with 2.3.40 Bordeaux mixture.

(4) Spray in field with 4·4·40 Bordeaux mixture.

(5) Remove and burn plants exhibiting virus disease symptoms.

(6) Cultivate well and, if possible, irrigate.

(7) Collect and burn crop remains and keep the farm free from weed growth.

(8) Rotate tomato land with non-allied crops for as long as economically practicable.

Leaf Miner and Stem Borer of Tobacco in North Queensland.

By D. O. ATHERTON, B.Sc.Agr., Assistant Entomologist.

TOBACCO has been grown in the various States of Australia for many years, but only recently has the crop assumed an important position in the economy of the country. Several years ago the Australian Tobacco Investigation established an experiment station near Mareeba, in North Queensland, to ascertain the suitability or otherwise of the surrounding areas for the production of bright flue-cured tobacco. The State Department of Agriculture and Stock co-operated with the Australian Tobacco Investigation, and the results of the development thus initiated are evident to-day in the importance of the Cairns hinterland as a tobacco producing centre. Bright tobacco is also produced in other parts of the State, but the investigations discussed in this report have been confined to the districts north from Mackay, these including Bowen, Ayr, Herveys Range, Woodstock, and the Cairns hinterland. During the 1929 season only 489 lb. of flue-cured tobacco were produced in the areas indicated, but production increased to over 6 tons in 1930, to 56 tons in 1931, and since then it has fluctuated between 270 tons and 500 tons each season.

It is not surprising that, coincident with this enormous increase in production, there has also been a considerable increase in the attention paid to the control of insect pests associated with the crop. The leaf miner, *Phthorimaea operculella* Zell., and the stem borer, *Phthorimaea heliopa* Low., the species dealt with in this paper, are two of the most important of these, and both have caused extensive losses. The former was recognised as a serious pest of the potato in Australia in 1854, (Berthan, 1855), and in many other potato-growing countries before the beginning of the present country. As potatoes have been produced for many years in some of the northern districts to which tobacco has recently been introduced it is not surprising that the latter crop should be attacked. The second species has not been recorded from economic plants other than tobacco, and until an account of the stem borer was published in "The Queensland Agricultural Journal" (Smith, 1932) the pest had not been recorded from tobacco in the literature of this State though it was well known in some other countries.

When both species were obviously becoming serious pests of tobacco, in the North at least, they were made the subject of a major investigation by the North Queensland Entomological Field Station. Control measures were difficult to formulate and both pests therefore warranted the fullest study. Laboratory work was carried out at Cairns and Atherton, but field investigations were conducted at Mareeba. This paper discusses the problem in the light of all the information at present available.

LEAF MINER.

The leaf miner, *Phthorimaea operculella* Zell., has been recognised as a serious pest of the potato, tomato, egg plant, and tobacco for many years in various parts of the world. It was reported as a pest in Australia, not specifically but as "the potato grub," as early as

1854 (Berthan, 1855). "The moth was described in 1878* from specimens from Texas, and its destructiveness to solanaceous plants came to notice shortly afterwards. Within a decade it was reported as an agricultural pest from Algeria and the Canary Islands in Africa, and from Australia and New Zealand in Polynesia" (Fullaway, 1914). It was soon reported from Hawaii and Southern Europe. Before 1912 the leaf miner was "known as the tobacco splitworm to the tobacco planters of Florida, the Carolinas, and Virginia, in which places the amount of damage done is at times very serious" (Chittenden, 1912). One author gave a map of its distribution as known to him in the year 1917 (Graf., 1917), but since then the known distribution of the species has extended to such a degree that it is now recorded as a pest from some of its cultivated solanaceous hosts in the following regions:—Brazil, Chile, Peru, Columbia, Porto Rico, Haiti, Cuba, Mexico, United States of America, Canada, Canary Islands, Norway, Austria, France, Spain, Portugal, Algeria, Tunisia, Sicily, Malta, Cyprus, Belgian Congo, South Africa, East Africa, Mauritius, India, East Indies, Guam, Hawaii, New Caledonia, New Zealand, Tasmania, and Australia.

Various opinions have been expressed regarding the place of origin of *P. operculella*, but the bulk of evidence points to the New World as the original home of the species (De Azevedo, 1924). The fact that it was recorded from Australia as early as the middle of last century does not discredit this theory, as there was a considerable volume of traffic between North America and Australia prior to the date of its first recorded occurrence in the latter country. It was apparently well established in the Americas and Australia before appearing in pest proportions in either Europe or Africa, but any existing early records are difficult of access. Much of the artificial distribution of *P. operculella* by the agency of man took place before facilities for recording the appearance of new pests had become as effective as they are to-day; therefore, it is not surprising that information respecting the original source of the species is somewhat fragmentary. However, it is probable that the insect is native to America, not only because of the considerations outlined above, but also because both the potato and tobacco, the more favoured of the cultivated hosts, are indigenous to tropical America.

In many countries the insect appears as a pest on the following cultivated plants:—Tobacco, potato, tomato, cape gooseberry (*Physalis peruviana*), egg plant (*Solanum melongena*), and chillies (*Capsicum* spp.). It has also been recorded from the following wild plants:—In America, *Solanum carolinense, S. nigrum, S. paniculatum, S. torvum, S. verbascifolium, Datura stramonium, Physalodes physalodes,* and *Physalis* sp.; in Europe, *Solanum commersoni, S. dulcamara, S. maglia, S. miniatum, Nicotiana sylvestris, Fabiana imbricata, Hyocyamus albus,* and *Lycium europeum;* in South Africa, *Datura stramonium;* and in the East Indies, *Solanum nigrum, S. torvum, Datura stramonium, D. suaveolens,* and *Physalis angulata.* In Australia it has been recorded from several cultivated hosts including tobacco, tomato, potato, egg plant, and cape gooseberry. There are very few previous records of wild hosts in the Australian literature, but *Solanum nigrum* and *S. sodomaeum* are reported from Western Australia (Newman, 1920). During the course of the investigations at present under discussion, larvæ of the pest have been found breeding in the foliage of at least three solanaceous weeds on and around tobacco farms. These weeds have been identified as *Solanum nigrum, Datura Metel,* and *Physalis minima* var. *indica.*

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* Obviously a misprint for 1873.

Description.

The moth (Plate 3; fig. 9) is quite small, being about 6·5 mm. long and little more than 13·0 mm. across the outspread wings. A spotted or mottled dark grey is the general colour impression gained from a cursory examination. The wings are held folded over the back when at rest and this habit apposes two rows of light and dark spots one row on each forewing. Thus there appears to be a double row of dark spots running along the dorsal wing surface of the resting moth. The forewings are grey, mottled with darker spots, and there is a short fringe of hairs on the outer or apical margin. The hind wings are light grey in colour and less scaly than the forewings, and are bordered by a fringe of long fine hairs from the apex round the apical and anal margins of the wing. The head and thorax are not mottled and are a lighter grey than the forewings. The sexes are easily separated by several readily discernible constant characters, two of which are (*a*) the abdomen in the female has a more robust construction than in the male, (*b*) the male possesses a girdling tuft or "kilt" of white or light grey hairs which project back from the penultimate segment of the abdomen and cover the genitalia.

The following is a translation of the description given by Zeller:—

"The male bears on the upper side of the anal segment a large oval disk, from each side of which protudes a readily perceptible tuft of crumpled hair. The somewhat lighter female—if it is the female—has somewhat wider forewings, and the dot on the cross-vein and the one before it darker in colour, the one toward the inner margin distinctly lighter.

"Of the sizes of the smallest (species) *terella* or of the largest (species) *senectella.* Head whitish, mixed with a little ocherous, brighter on the dorsum. Ocelli I cannot perceive. Antennae gray, lighter on the undersides, with well-defined joints. Palpi whitish, second joint flattened, with noticeably channelled bristles, and having a gray efflorescence on the outer sides near the end. Third joint more than half as long as the second, awl-shaped, finely pointed, with a brown spot between the base and middle. The four front legs light gray, the outsides dusted with brown, tarsi brown, the joints with whitish ends. The hind legs pale yellow, the tibiae with small light coloured hairs, and the tarsi brownish at the joints. Abdomen yellowish dust-gray, grayish-white beneath, the last joint, in the male, as long as one-third of the abdomen, bright ocher yellow. Two elliptical, somewhat hollowed disks lying with their hollows upon one another. The lower projects somewhat from beneath the upper and is clothed on the upper side with a rich covering of somewhat loose-lying hairs, appressed above and projecting over the margin. On both sides of the base of the upper disk stands an outwardly crumpled brush of hair reaching nearly or quite to the end. In the female the anal joint is of the usual length, and is of the form of a truncated cone, the ovipositor slightly projecting. Forewings 2¼ to 2½′′′ in length, smaller in the male than in the female, light gray, dusted yellowish gray, particularly towards the base, in the middle pure ocherous; along the middle fold lies a longitudinal blackish streak, enclosed at both ends with whitish dashes. Above this lie two

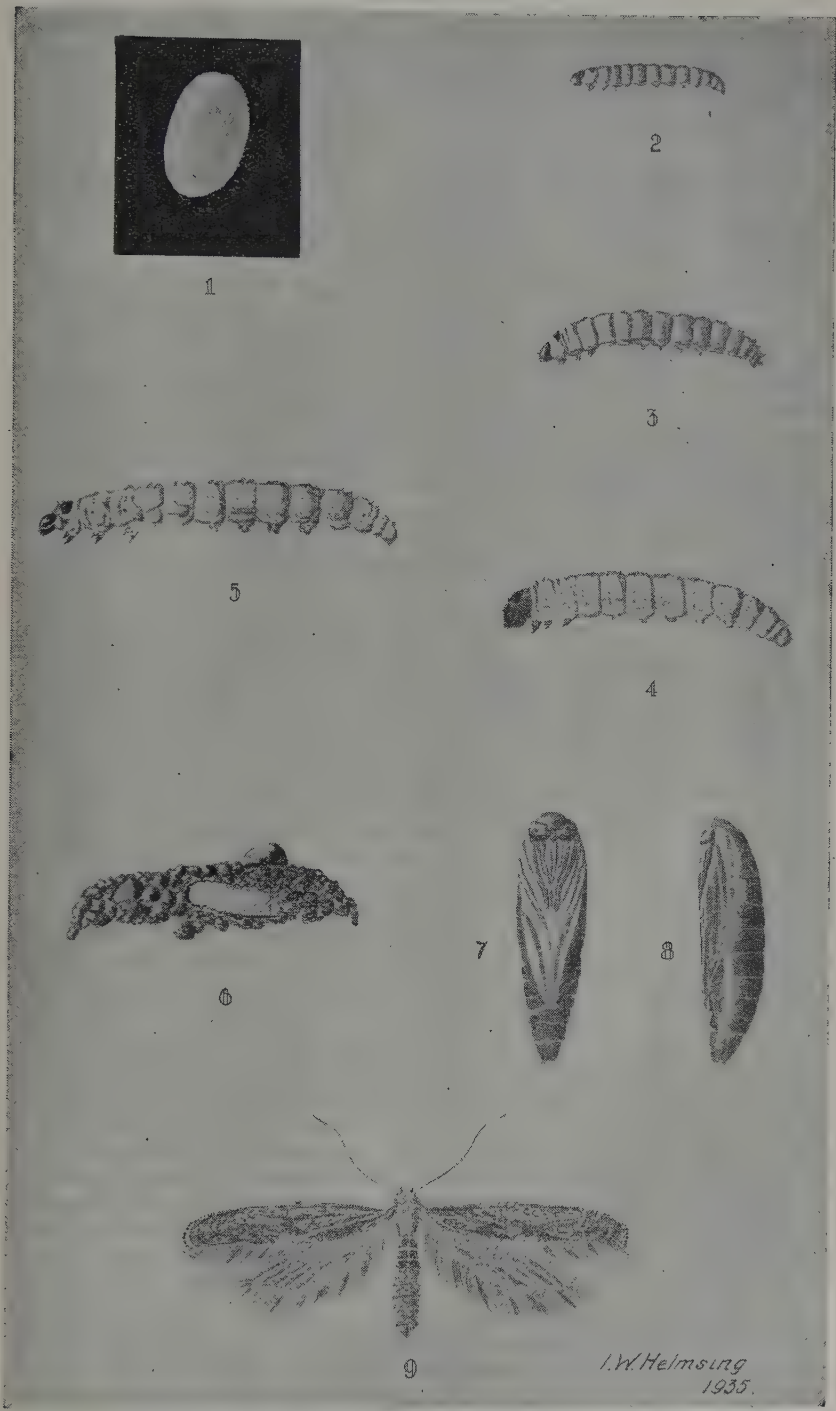


PLATE 3.

Tobacco Leaf Miner (*Phthorimaea operculella* Zell.). Fig. 1.—Egg × 35. Fig. 2.—First instar larva × 10. Fig. 3.—Second instar larva × 10. Fig. 4.—Third instar larva × 10. Fig. 5.—Fourth instar larva × 4. Fig. 6.—Earthen cocoon × 2½. Fig. 7.—Pupa, ventral view × 7. Fig. 8.—Pupa, lateral view × 7. Fig. 9.—Adult × 4.

small blackish dots, the lower nearer the base than the upper. On the cross-vein is a larger dot, nearly ringed about with light gray. At the rear margin is an indistinct row of blackish, somewhat larger dots. Fringes light gray, inwardly dusted with darker, and especially near the tip.

"Hind wings hardly as broad as the forewings and with underturned hind fringe, bright gray; fringe longer than the width of the wing, with a yellowish sheen towards the base. The entire underside uniform gray.

"In a doubtful female the whole dorsum is of the same colour as the head, the abdomen as before stated. The broader forewings are lighter at the front margin, plentifully sprinkled with uniform gray without the usual ocherous colour in the middle, and the general ocherous tone of the whole. At the fold lies a black dot with a whitish border. Obliquely behind and over this dot there is no double spot, but a separate stronger deep-black, ringlike dot, bright and strikingly inclosed. The cross-vein dot is smaller, but also black and similarly ringed with light colour. Since the hind fringes are almost entirely broken off, I cannot say further about the markings. The hind wings are sensibly broader than the forewings, and less finely pointed." (Graf, 1917.)

Life History.

The following notes describe the various stages in the life history of the pest—egg, larva, pupa, and adult. Some discussion of Dyar's hypothesis as applied to this species and of the relationship of temperature to development is also included.

Egg.

The eggs (Plate 3; fig. 1) are more or less oval in outline, but sometimes one end is more acute than the other and then there is a striking resemblance to the shape of a hen's egg. In one measured series the mean length was $481 \pm 33\mu$ and the mean width at the widest part $349 \pm 16\mu$. When laid the eggs are covered by a water soluble secretion which hardens on exposure and thus cements the eggs to the substratum on which they rest. It might be expected that owing to the solubility of the cementing medium the eggs would be washed from the plant by rain, but few, if any, are actually removed in this manner. In the first place it has been shown that, at least in North Queensland, most of the eggs are laid on the soil, and secondly, of the few actually laid on the plant, the majority are so well pressed in between the glandular hairs of the epidermis that displacement is difficult. Newly laid eggs are whitish in colour but iridiscent in some lights. The chorion is smooth except for faint irregular reticulations formed by slight linear depressions. These reticulate markings are not necessarily always present, and even when they are visible generally extend over only a portion of the chorion. As the development of the enclosed embryo proceeds the dark colour of the larval head capsule and prothoracic plate begins to show through, gradually becoming more evident as the time for eclosion approaches.

As the egg stage nears completion the shape of the enclosed larva may be seen through the chorion and is more or less distinctly visible some time before hatching takes places. The anterior and posterior portions of the ventral surface are closely pressed together as the larva lies folded inside the egg. For one or two hours before emerging from the egg the larva may be seen moving about within the confined space. Eventually it begins to eat its way out of the chorion through a crescent-shaped opening, usually near one end of the egg. Pieces of the chorion are bitten off and thrust outside until the hole is large enough for emergence. When eclosion has occurred the chorion is left as a colourless shell practically invisible to the naked eye, though it may be strongly iridescent in some lights.

TABLE 1.

LIFE HISTORY OF THE LEAF MINER.

Date Eggs Laid.	Days Duration of Life-history Stages.									Date Moth Emerged.	Sex.
	Egg.	Ist Larval Instar.	2nd Larval Instar.	3rd Larval Instar.	4th Larval Instar.	Prepupal.	Total Larval.	Pupal.	Total. All stages.		
7–7–32	11	6	5	4	6	4	25	13	49	25–8–32	♀
7–7–32	12	7	4	4	9	3	27	12	51	27–8–32	♀
18–7–32	7	6	6	6	8	2	28	14	49	5–9–32	♂
20–7–32	9	6	5	7	5	2	25	10	44	2–9–32	♀
20–7–32	9	6	5	6	5	1	23	12	44	2–9–32	♂
25–7–32	8	6	5	5	6	1	23	11	42	5–9–32	♀
25–7–32	8	6	5	6	5	1	23	12	43	6–9–32	♂
26–7–32	8	5	5	4	7	3	24	12	44	8–9–32	♂
26–7–32	8	6	4	5	6	2	23	11	42	6–9–32	♀
26–7–32	8	5	5	5	6	2	23	11	42	6–9–32	♀
26–7–32	8	5	5	5	3	4	22	12	42	6–9–32	♂
26–7–32	8	5	5	4	6	2	22	11	41	5–9–32	♀
1–8–32	9	5	4	5	3	2	19	12	40	10–9–32	♂
1–8–32	9	7	4	5	6	1	23	14	46	16–9–32	♀
1–8–32	9	6	3	4	3	2	18	13	40	10–9–32	♂
Winter Average	8·7	5·8	4·7	5·0	5·6	2·1	23·2	12·0	44·0	..	..
28–9–32	5	4	3	3	3	2	15	7	27	25–10–32	♂
28–9–32	5	5	3	3	4	2	17	8	30	28–10–32	♀
8–10–32	5	3	2	2	3	1	11	6	22	30–10–32	♀
8–10–32	5	4	2	3	3	1	13	9	27	4–11–32	♀
13–10–32	5	4	3	2	3	2	14	7	26	8–11–32	♀
30–11–32	5	3	2	3	2	1	11	8	24	24–12–32	♂
30–11–32	5	4	3	2	2	1	12	7	24	24–12–32	♂
30–11–32	5	3	3	2	4	1	13	7	25	25–12–32	♀
Spring Average	5·0	3·8	2·6	2·5	3·0	1·4	13·3	7·4	25·6	..	..

The time occupied in the egg stage (Table 1) was found to vary a great deal both with individuals and also with the time of the year. In July some eggs hatched seven days after they were laid, while in others the incubation period was as long as twelve days. The majority of winter eggs, however, were either eight or nine days incubating and twelve days was decidedly unusual. As summer approached the period of incubation decreased and in that season most of the eggs completed their development in either four or five days.

Larva.

The newly emerged larva, which is about 1·0 mm. long, is either colourless or very faintly yellowish pink except for the head capsule and dorsal shield of the prothorax, these being dark brown or black in colour. It is quite inconspicuous on the soil and among the glandular hairs which cover the surface of the tobacco leaf. Mature larvæ (Plate 3; fig. 5) attain a length of nearly 15 mm. at times, though the majority range between 10 and 13 mm. The head capsule and prothoracic shield retain their original dark colour, but the remainder of the body changes colour slightly to either gray or yellowish pink. In potato tubers the larvæ are generally much lighter in colour than in the aerial parts of that plant or in tobacco. Owing to these differences in colour and habitat of the larvæ there was at one time some confusion in identification (Spencer and Strong, 1925), but there is now no doubt that only one species is involved.

Larvæ hatched on the plant may begin feeding immediately after emergence, eating their way through the chorion directly into the leaf. But it is more usual for some exploratory wandering to occur before leaf mining begins. Most larvæ, emerging on the ground near the plants, are, of course, forced to do some wandering before finding a suitable feeding site. The mines are initiated on almost any part of the leaf with the exception of the veins and may start at the edge of the lamina or beside a vein, or even beside the midrib. Before starting the mine proper the larva often spins a small amount of webbing from the mouth. This webbing has a silky appearance and is attached to a few of the glandular hairs on the surface of the leaf in the vicinity of the part about to be mined and serves to remove from the mouth parts of the larva the first pieces of epidermis which are uneaten. The fact that this epidermal tissue is not consumed merits consideration during the formulation of control measures. After making this observation a similar statement was discovered in an old paper written in 1913, though in this case the habit referred to concerns the larvæ of *P. operculella* on potatoes. "Observations tended to show that the larva rejected the skin and did not ingest any material until it had penetrated into the subjacent starchy tissue of the tuber." (Stoward, 1913.)

The mines are quite irregular in size and shape but the whole of the mesophyll is eaten and the epidermis of both leaf surfaces left intact. When initiating a mine and for a few days immediately thereafter, larvæ have been known to construct and use a silken frass-covered tunnel on the surface of the leaf leading away from the entrance. This is part of the very early phase and subsequently the larvæ live within the mines. The mines may pass through veins or even the midrib of the leaf and tunnels leading for a short distance along the centre of the leaf midrib have been observed. As the mines extend the frass is packed into corners of the tunnels.

The larva usually spends the whole of its prepupal life inside the original mine. Sometimes, however, three and even four mines are constructed and inhabited for a longer or shorter period by the same larva during the course of its development. The larva may be forced to leave the original mine by natural circumstances—e.g., a small leaf in which the mine is initiated may contain insufficient nourishment to carry the larva right through its development or, the miner in feeding may sever the midrib and cause the leaf to wither, thus rendering it unsuitable as food. The total area of leaf lamina destroyed by one larva varies considerably, probably depending, to some extent at least, on the age and thickness of the attacked leaf. The actual area destroyed by single larvæ in the laboratory varied from six to eight square centimetres.

Larvæ often travel from one leaf to another in the seed-bed, and this may be accomplished by joining two adjacent leaves with a silken tunnel, although migration outside the protection of tunnels is not uncommon. In other countries it has been stated that the leaf miner rarely attacks leaves at any distance from the ground, and is therefore of little economic importance (Bondar, 1925, Jack, 1927, and Edwards, 1929), but the significance of the pest in seed-beds has been stressed by several authors (Fullaway, 1914, De Bussy, 1914, and Edwards, 1929). In North Queensland, however, as well as being a menace to plants in seed-beds, the pest may also cause considerable losses in the field. When a field is severely attacked the insect does not confine its attention to leaves near the bases of older plants, but also attacks leaves near the top. The severity of the attack and the effect of weather conditions on the plant are two factors which determine the height at which mines may be initiated. When weather conditions favour rapid growth and there is a mild attack by the pest, only the lower leaves are likely to be infested, but with weather conditions favouring slow growth and a severe attack by the pest, leaves near the tops of the plants may be attacked. Only lower leaves are attacked in moderate infestations during good growing weather, as the plants in normal growth apparently outstrip the pest. Larvæ of the leaf miner in the field do not always confine their attention to leaves, and it is not uncommon to see damage by this insect on the main stem of the plant. This damage appears as serpentime mines in the chlorophyll-bearing cortical tissue outside the vascular cylinder. The newly hatched larvæ may attack the stem directly or may invade the cortical tissue through the residual stipules after the leaf is picked. In the latter case the mesophyll of the stipule is probably destroyed before the stem is entered. The stem mines are irregular and meandering in direction, and may even completely encircle the stalk. They are discernible as narrow raised areas, seldom more than one-eighth of an inch across, contrasting with the mines made by the same species in the leaves. The latter are seldom linear after the first day or so but cover irregular patches.

During the course of their development the larvæ pass through four instars (Plate 3; figs. 2, 3, 4, and 5), but the time occupied by each instar varies greatly with the individual. Variations under winter climatic conditions were observed in some detail, and the observations (Table 1) show that the first instar occupied from five to seven days, the second from three to six days, the third from four to seven days, and the final instar from three to nine days. The means for successive instars were 5·8 days, 4·7 days, 5·0 days, and 5·6 days respectively. The prepupal period is not included in the fourth instar figures.

The head of a larva when newly hatched and for a short time immediately succeeding each ecdysis, is generally carried partly retracted within the prothorax but is protruded at will. Towards the end of each instar, however, the growth of the body is so pronounced that the head is kept permanently protruded to the full extent of the neck, and the prothoracic shield is found well back from the head capsule instead of being partly superimposed on it, as happens shortly after an ecdysis has occurred. Ecdysis occurs within the mine, the exuviæ and cast head capsule generally being left wherever the ecdysis takes place, although sometimes these cast structures are pushed into the frass heap. Probably not more than one or two square centimetres of leaf tissue is destroyed until the final instar is reached, but during this fourth instar the pest is very destructive and increases rapidly in size.

When full fed the larvæ desert the leaves and after selecting suitable sites spin cocoons of fine silk, these usually being completed within twenty-four hours of the larvæ deserting the mines. The larvæ then shrink considerably in length and become very torpid, remaining in this quiescent stage for two or three days in the winter, though less in summer, before pupating.

Dyar's Hypothesis.

Dyar in discussing the number of moults of lepidopterous larvæ contended that "the widths of the head of a larva in its successive stages follow a regular geometric progression and if, in examining the measurements of heads taken in following out a life history, any deviation from the calculated progression is shown, it is evidence that an error has been committed or that the larva has behaved in an abnormal manner" (Fisher, 1924). As the early instars of *P. operculella* are minute it is difficult to separate them by ordinary means, and therefore Dyar's hypothesis was applied to clarify the position. A number of measurements of the widths of larval head capsules was recorded, these being obtained by the use of a micrometer scale inserted in the eyepiece of a binocular microscope. As such readings would be inconveniently small if recorded as millimetres they are referred to as direct readings of the scale, e.g., "width of head capsule of first instar 7·5" indicates the width in scale divisions only. Thirty-eight of these divisions are equivalent to one millimetre—i.e., the factor 0·0263 converts scale readings to millimetres.

It was found that the head capsules from the first, second, and third instars were not distorted after ecdysis, but cast head capsules from the fourth instar were distorted a great deal. In the earlier instars the head capsule is cast entire, but in the final ecdysis there is a rupture of the capsule along the median line of the lower face and this causes the distortion. Therefore, although it is possible to follow the complete development of individual larvæ, and collect the head capsule after each ecdysis, the measurement of the final larval head capsule when taken after ecdysis is not comparable with those from earlier instars. Consequently, in the records of individual larvæ in Table 2 measurements for the final head capsule are not included. These larvæ were required for life history data, and the use of chloroform for their constraint during measurement was not considered advisable.

TABLE 2.

HEAD CAPSULE SIZES OF SUCCESSIVE INSTARS IN THE LEAF MINER.

The size increase ratio is given for each ecdysis.

(38 units = 1.0 mm.)

Instar I.	Ratio.	Instar II.	Ratio.	Instar III.
7·2	1·612	11·6	2·242	26·0*
7·5	1·733	13·0	1·692	22·0
7·5	1·733	13·0	1·731	22·5
7·5	1·733	13·0	1·731	22·5
7·7	1·636	12·6	1·746	22·0
7·7	1·753	13·5	1·689	22·8
7·8	1·603	12·5	1·760	22·0
7·8	1·564	12·2	1·803	22·0
7·8	1·744	13·6	1·706	23·2
8·0	1·500	12·0	1·750	21·0

* This larva died after moulting to the third instar.

The measurements recorded in Plate 4 (Graph 1) were made from larvæ selected at random from spirit material. From these no attempts to correlate the measurements for successive instars is possible. Obviously, however, the measurements are readily divisible into groups, though the range within the groups is somewhat wide. Each group represents an instar, and the value of the hypothesis in separating the instars is thus well illustrated. The means for the successive groups are: (1) 7·55 ± 0·51, (2) 12·75 ± 0·55, (3) 21·65 ± 1·0, and (4) 34·9 ± 2·6. This deduction of four instars was confirmed by subsequent observations. The mean ratio of increase between the successive means as given

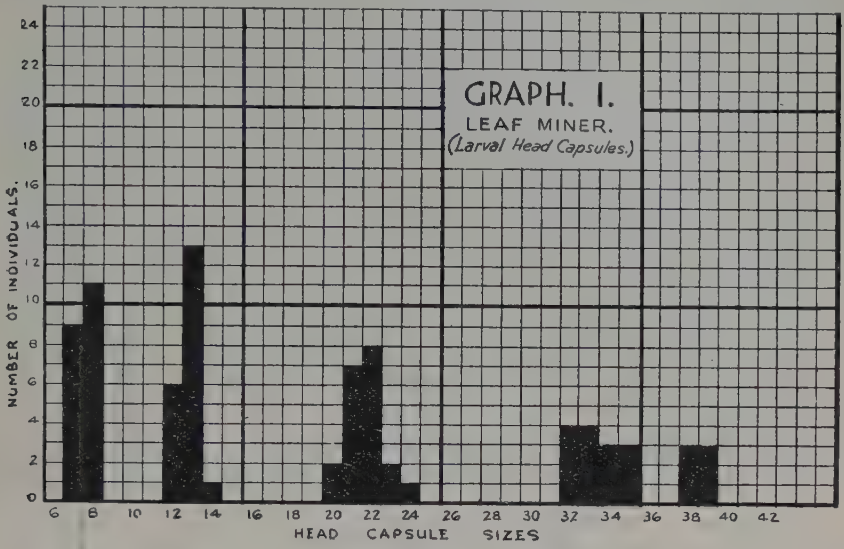


Plate 4.

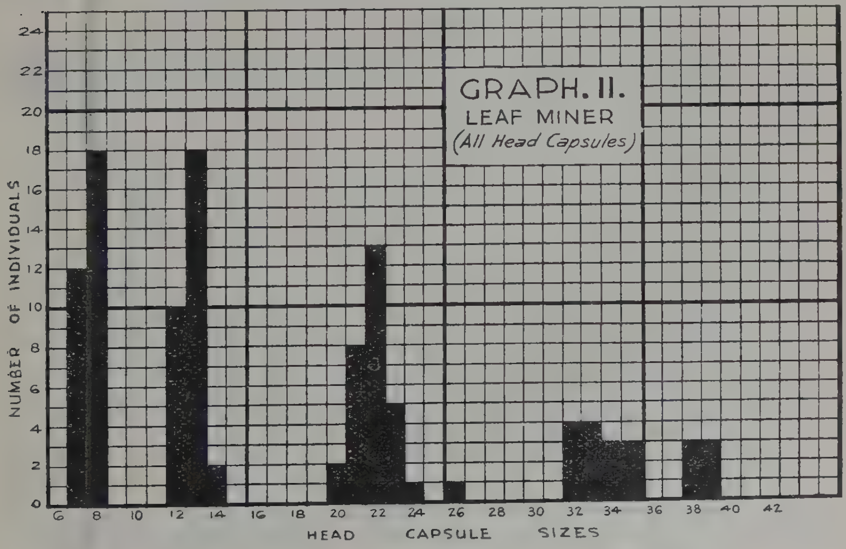


Plate 5.

above is 1·67, but even in such a restricted series it is not constant between groups. Between the first and second it is 1·69, between the second and third it is 1·70, and between the third and fourth 1·61.

Even when individual larvæ were followed through their ecdyses (Table 2) the ratio of increase between successive instars was by no means constant. It varied between the first and second instars from 1·50 to 1·75, and between the second and third instars the ratio varied from 1·69 to 1·80. Obviously the development of the first larva in the series was abnormal, as it died before moulting again or pupating. Thus a deviation from the regular geometrical progression of more than 16 per cent. has been observed between the factor for one ecdysis and that for the previous one, even in the same individual (Table 2; last larva). As these individuals afterwards completed their development and reproduced normally there can be no doubt that they behaved in a normal manner.

The average ratio of increase in the size of the head capsule between instars as shown in Table 2 is 1·70. The observed ranges in size for the various instars, including measurements shown in Plate 5 (Graph 2), are compared in Table 3 with the ranges calculated on this 1·7 ratio.

TABLE 3.
HEAD CAPSULE SIZES OF LEAF MINER.

Head Size.	Instar I.	Instar II.	Instar III.	Instar IV.
Calculated	7·0—8·0	11·9—13·6	20·2—23·1	34·4—39·3
Observed	7·0—8·0	12·0—14·0	20·0—24·0	32·0—39·0

These experimental data show that the hypothesis was useful in determining the number of larval instars in *P. operculella.*

Pupa.

The cocoon (Plate 3; fig. 6) is constructed in various places, but when the larva develops on a mature plant in the field it commonly occurs on the plant. When, however, the larva has developed on a small plant either in the seed-bed or in the field, the cocoon occurs on a convenient clod of earth, on dead leaves, or on other rubbish at the base of the plant. Wherever it is constructed the cocoon always displays certain characteristic features. It consists of a closely woven silken framework covered with some such material as frass, small particles of earth, or grains of sand. That part of the cocoon in contact with the substratum is closely attached thereto. When the cocoon is formed on the plant itself it often occurs alongside the remains of the laminate petiolar leaf extensions where the latter arise from the surface of the stem. Under these circumstances the cocoon, being covered with particles of frass or small pieces of dead leaf, is somewhat inconspicuous. The cocoon formed on the earth near the base of the plant, being covered by fragments of sand and rubbish, is also inconspicuous, and it would appear that the covering materials afford some slight protection from the attentions of natural enemies as they blend so well with the surroundings. The cocoon is roughly oval in shape, one side is flattened and closely appressed to the substratum, and it measures 9 mm. in length and 4 mm. in width. When constructed in the laboratory on a substratum of glass the part of the cocoon in contact with the glass was semi-transparent, and through it the outline of the pupa could be observed.

The pupa (Plate 3; figs. 7 and 8) immediately after formation is light green in colour and appears almost translucent, but it soon takes on a deeper hue and after a day or two is brown. The depth of colour increases until the pupa is very dark-brown or almost black immediately before the adult appears. Pupæ vary considerably in size, but they are seldom less than 6 mm. and not more than 9 mm. in length. Size is dependent to some extent at least on the amount of food available to the larvæ, those having the most food producing the largest pupæ. Male pupæ are usually smaller than female pupæ when developed under similar conditions. Larvæ of different sexes reared in the laboratory from the one batch of eggs and fed on the same leaves generally produced pupæ which differed slightly in size, the female being the larger. The sexes of the pupæ are readily determined on the position and size of the obsolete gonopore (Plate 6; figs. 3 and 4) situated on the ventral surface of the ninth abdominal segment.

The duration of the pupal stage varied considerably at different times of the year. The mean duration in the winter months was twelve days, varying from ten days to a fortnight, while in summer the stage was completed in about a week.

Length of Life Cycle.

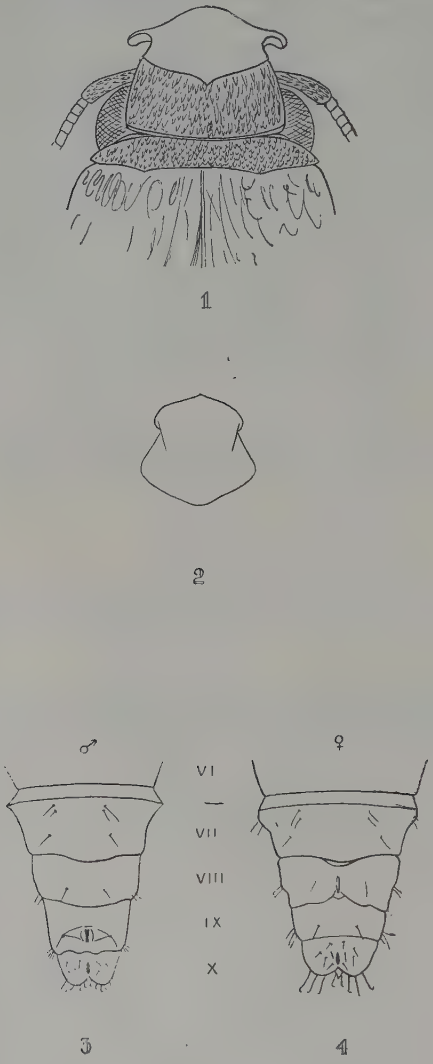
The duration of the life cycle in Cairns from the time the eggs were laid till the adults emerged varied from forty to fifty-one days in winter and from twenty-two to thirty days in early summer (Table 1).

Temperature and Development.

It is a well recognised and important fact that the rate of development of the immature stages of an insect is dependent, to a large extent, on the prevailing temperatures under which the insect exists. The extent of the ravages caused by the leaf miner is therefore very largely dependent on the rapidity with which generation follows generation when temperatures are high during summer while the host crop is being produced.

Experimental observations with the species in Cairns showed that development was almost twice as fast during the summer months as it was during winter. This variation in the time required by the developing insect to reach maturity affects its economic relationship with tobacco in two ways. The acceleration during summer when the seedlings and field crops are being grown ensures a rapid increase in the numbers of the pest at a time when it effects maximum losses. The retardation during winter when there is a greatly reduced food supply and much slower growth in its host plants enables the pest to utilise this diminished food supply advantageously and thus increases its ability to survive the winter period. A carry-over population is thus maintained through the winter and readily infests the new season's crop.

A somewhat detailed consideration of the temperature factor is included in this discussion. Obviously some means of measuring that factor is essential for the full interpretation of experimental data, and a widely accepted method of measurement depends for its validity on the fact that all development ceases at temperatures below a certain minimum known as the threshold of development or theoretical zero of development, measurement being expressed in terms of day-degrees or effective day-degrees. A day-degree is equivalent to one degree of



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1932.

PLATE 6.

TOBACCO LEAF MINER (*Phthorimæa operculella* Zell.).

Fig. 1.—Eclosion cap on face of moth. Fig. 2.—Front view of eclosion cap. Fig. 3.—Abdominal segments of male pupa. Fig. 4.—Abdominal segments of female pupa.

temperature maintained for twenty-four hours. An effective day-degree is equivalent to one degree above the threshold of development maintained for the same period (Peterson and Hæussler, 1930). The value for the threshold of development varies with different species of insects, and in the following discussion that for *P. operculella* is taken as 52 degrees Fahrenheit (Langford and Cory, 1932). All values are in degrees Fahrenheit, and the method of computing day-degrees is that proposed by S. A. Forbes for use when only maximum and minimum thermometer readings are available (Glenn, 1918).

A daily record of effective day-degrees for six months is presented in Plate 7 (Graph 3). By using this information in conjunction with the laboratory records from Cairns (Table 1) it has been possible to compile a table showing the cumulative day-degree requirements for a short series of individuals (Table 4). This table indicates considerable variation in the day-degree requirements for the completion of any one stage by different individuals. The figures for the egg stage vary from 95 to 148 with a mean of 118, thus giving a variation of almost 45 per cent.; for the larval stage they vary from 298 to 419 with a mean of 351, a variation of 34·5 per cent.; while for the pupal stage the figures are 180 and 254 with a mean of 221, a variation of 33·5 per cent. The total effective day-degrees required for development from the day the egg is laid till the day the moth emerges varies from 606 to 766 with a mean of 690, which is a variation of 23 per cent. Thus it appears that although there is a certain amount of correlation between the accumulated day-degrees and the rate of development it is not of a very high order. However, as life history observations were made only once every

TABLE 4.

TEMPERATURE AND DEVELOPMENT OF THE LEAF MINER AT CAIRNS IN 1932.

Date Eggs Laid.	Effective Day—Degrees.				Date Moth Emerged.
	Egg.	Larva.	Pupa.	Total.	
7–7–32	131·76	335·12	212·32	679·20	25–8–32
7–7–32	147·51	363·40	206·79	717·70	27–8–32
18–7–32	94·84	399·60	231·00	725·44	5–9–32
20–7–32	116·62	363·57	194·75	674·94	2–9–32
20–7–32	116·62	329·07	229·25	674·94	2–9–32
25–7–32	112·79	339·81	217·25	669·85	5–9–32
25–7–32	112·79	339·81	236·25	688·86	6–9–32
26–7–32	110·43	328·91	217·25	656·58	5–9–32
26–7–32	110·43	328·91	326·25	675·59	6–7–32
26–7–32	110·43	348·41	216·75	675·59	6–7–32
26–7–32	110·43	348·41	216·75	675·59	6–7–32
26–7–32	110·43	367·41	236·25	714·09	8–7–32
1–8–32	113·62	297·95	253·75	665·32	10–9–32
1–8–32	113·62	316·95	234·75	665·32	10–9–32
1–8–32	113·62	397·95	250·25	761·82	16–9–32
Winter Averages	115·06	347·02	225·97	687·99	. .
28–9–32	110·75	361·50	205·25	677·50	25–10–32
28–9–32	110·75	419·25	236·50	766·50	28–10–32
8–10–32	119·00	307·00	179·50	605·50	30–10–32
8–10–32	119·00	367·75	245·00	731·75	4–11–32
13–10–32	132·50	408·25	184·00	724·75	8–11–32
30–11–32	130·50	311·25	228·75	670·50	24–12–32
30–11–32	130·50	337·00	203·00	670·50	24–12–32
30–11–32	130·50	364·00	205·00	699·50	25–12–32
Spring Averages	122·94	359·50	210·88	693·31	. .

twenty-four hours, an error of almost a day is possible in measuring the duration of any one instar. The probability that such errors have occurred is heightened by the fact that the percentage variation in effective day-degrees required for different individuals in any one instar and for complete development is progressively less with the increase in the number of days over which the records were accumulated. It is interesting to note that the effective day-degree figures obtained with this species in Cairns correspond fairly closely with values obtained in Maryland in North America, even though the larvæ in the latter centre were bred in potato tubers (Langford and Cory, 1932).

The number of individuals included in the Cairns records is small, and this limits the value of the results obtained. Nevertheless, they do indicate temperature as being an important factor in the variation of summer and winter developmental periods. It is also obvious that when the duration of the various stages is recorded in days only, the value of such a record is not so great as when temperature data are added.

Moth.

As the time for emergence approaches some notable changes occur in the appearance of the pupa. The length is increased by an extension of the abdominal segments, and the annular character of each segment is very clearly defined. This contrasts with the earlier appearance of the pupa when the constriction between the segments, though definite, is inconsiderable. During the last day of the pupal period the moth can be discerned through the cuticle and is apparently bathed in a liquid medium. Convulsive movements take place when emergence is imminent, and finally the cuticle is ruptured and the adult appears. Presumably emergence is aided by the bathing liquid as the moth is still wet immediately after the event. Rupture of the cuticle invariably occurs along certain well defined sutures surrounding the fronto-clypeus and vertex and also down the dorsum of the thorax. As the adult emerges from the pupal shell the eclosion cap (Plate 6, figs. 1 and 2), consisting of the fronto-clypeus and vertex, is retained on the head and by convulsive movements against one end of the cocoon the moth gains its freedom. The eclosion cap is shed within a few minutes of emergence, and after reaching a suitable resting place the moth remains still for about half an hour until the wings expand.

The number of eggs laid by individual moths varies a great deal, normally mated females in the laboratory laying from 13 to 163 eggs each, the mean of a series being 65. The greatest number of eggs laid by one female in twenty-four hours was 51. The laboratory records show that no eggs were laid between the hours of 9 a.m. and 6 p.m. The moths are usually inactive in the field during daylight but commence activity soon after dark and flight continues for two or three hours or even longer, eggs being laid during this flight period. Early in the morning, within an hour or two after sunrise, moths have been seen on the wing, but the flight is never of long duration. Data collected in a heavily-infested block of potatoes suggested that the morning activity is essentially a mating flight. Males greatly predominate in this early morning activity, being in the proportions of approximately three to five males to every female. It is unusual for moths disturbed during the day in the field to make a protracted flight, a short snappy flight of at most a few yards being common. During the earlier hours of the night much longer flights sometimes occur as the adults of both sexes have been taken at lights several chains from the field. Moths have also been reported to fly several miles, though perhaps with the aid of winds (Cockerell, 1928).

Egg laying may begin within twenty-four hours after mating or it may be delayed for several days. In one instance the moths had been mated for over three weeks before eggs were laid, but this pair had been bred in the laboratory on a very limited food supply and were exceptionally small specimens. Eggs have been laid as long as five and a-half weeks after first mating the moths, but in the whole of the laboratory material over 90 per cent. of the eggs were laid within three weeks of first mating.

From laboratory egg-laying observations there are indications that normal oviposition is dependent to some extent at least on repeated acts of coitus. One pair of moths were mated on 14th July and the male died two days later. Six fertile eggs were laid on the 20th and three on the 21st, but no more eggs appeared until the 29th when two infertile eggs were laid. On 2nd August a day-old male was introduced and on 8th August eight fertile eggs were laid, two more on the following day, and ten more on the 10th. The pair were seen copulating on the 11th and 13th and on the 13th two more fertile eggs were laid. The male died on 14th August, but fertile eggs were laid on the 15th and 16th, the female dying on the 25th. Other data suggesting a similar interpretation have also been obtained.

It has been stated that smooth surfaces are not suitable for oviposition which is only stimulated by unevenness in the surface of the host (Pickard, 1913), but laboratory observations show that this statement may not be generally applicable. Moths confined in glass vessels partly closed by calico laid eggs on both glass and cloth, 192 eggs in one series being laid on glass and 263 on calico. In another case a seedling standing in a small jar of water on a white paper-covered table was enclosed in a large glass jar and a pair of moths was liberated in the jar for twenty-four hours. The eggs laid totalled 51, 27 being on the glass, 18 on the white paper, and only 6 on the plant itself. This moth certainly did not show a preference for the rougher surface when choosing a site for oviposition. Egg laying has not been observed directly in the field, but as it almost certainly occurs in the dark this is not surprising. Eggs have been found on almost any part of the young plants in seed-beds, including both leaf surfaces and the stem. They may also be laid on larger plants, and occasionally several eggs are laid close together on the surface of a leaf in the depression adjacent to a vein, although normally eggs are laid singly. Recent work in the laboratory, however, has indicated that by far the greater proportion of the eggs are actually laid on the soil about the base of the plant. Observations made on heavily-infested seed-beds definitely supported this conclusion, and soil taken from such seed-beds yielded numerous larvæ when the associated eggs hatched. There can thus be no doubt that in this species the bulk of the eggs are laid on the soil.

Observations on the duration of adult life have necessarily been confined to moths in the laboratory, and the figures obtained are probably greater than those which would apply to moths living under field conditions. Moths in the Cairns laboratory during the late winter lived as long as two months, but others in the same season and under comparable conditions lived no more than three weeks. There seems to

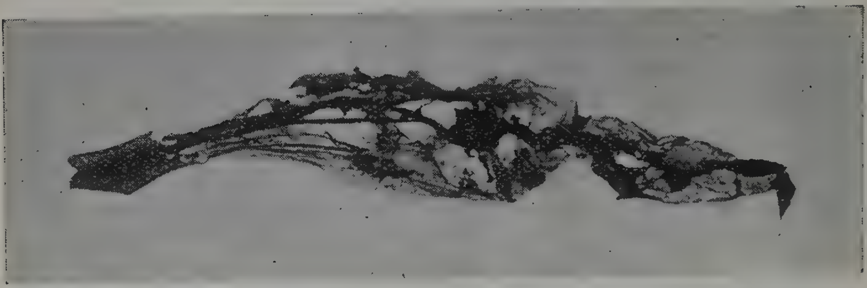

FIG. 1.

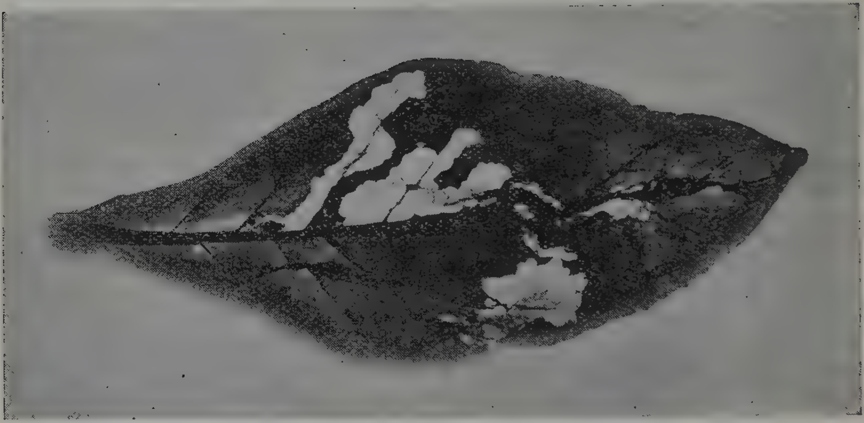

FIG. 2.

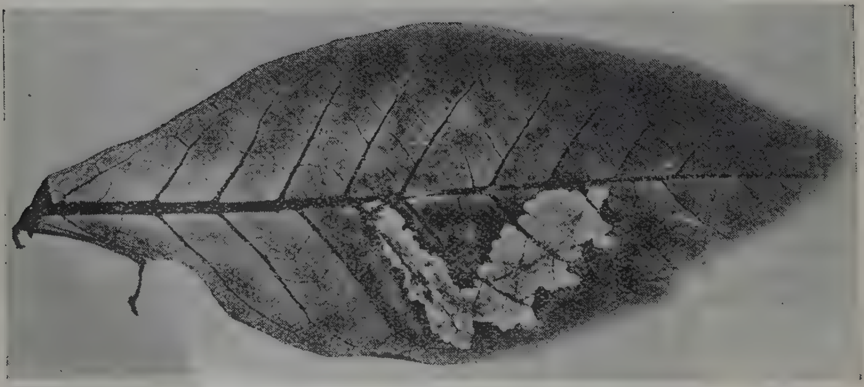

FIG. 3.

PLATE 8.—TOBACCO LEAF MINER (*Phthorimæa operculella* Zell.). Tobacco leaves mined by the Tobacco Leaf Miner.

be no significant difference in longevity between the sexes. The average age at death of late winter laboratory moths was, roughly, five and a-half weeks.

The number of generations in a year varies a great deal under the different climatic conditons of various countries, but as many as thirteen generations in eleven months have been recorded (Husian, 1926). As breeding is continuous throughout the year in North Queensland there is no clear line of demarcation between generations, and all stages are present continuously throughout the year wherever host plants are available. As the host plants include the potato and the tomato, as well as solanaceous weeds, a complete absence of hosts, even where tobacco is the primary crop, is very unlikely. Some indication of the expected number of generations each year may be deduced from the data presented in the discussion on temperature and development. The total effective day-degrees from July to December, inclusive, approaches 4,000 for both Cairns and Mareeba, and therefore 8,000 effective day-degrees annually for either centre is a justifiable assumption. Something less than 700 effective day-degrees are required for the development of the average individual (Table 4), and the preovipositional period probably requires about 50 effective day-degrees. Thus 750 effective day-degrees would be required for one generation of the pest. At this rate there must be ten or eleven generations in a district where 8,000 effective day-degrees are experienced in the year. Tobacco is available as a host in the northern districts of Queensland for at least nine months of the year, from October till June, inclusive. During this period, if it is assumed as before that 750 effective day-degrees are required for one generation, eight generations are possible, or perhaps nine. A small infestation in October, in a season which favours the pest and allows of almost unhindered reproduction, becomes quite serious by the beginning of the following year, and the effect on the crop may then be disastrous, particularly when planting out operations have been delayed by seasonal conditions.

Injury.

Outbreaks of leaf miner may be centred on seed-beds or in the field, and in both serious losses sometimes occur. The characteristic damage (Plate 8; figs. 1, 2, and 3), as one would expect from the popular name, is a mining of the leaves. Irregular areas of the mesophyll are eaten, the epidermis covering both leaf surfaces being left intact. When a damaged leaf is held up to the light the mines are apparent as translucent blotches in which the larvæ are often visible. Sometimes larger plants in the field are damaged in a different way, the larvæ constructing narrow tortuous mines in the cortext immediately under the epidermis of the main stem. These mines are apparent as meandering slightly raised areas around the stem, not much more than one-eighth of an inch wide. During severe attacks the stem may be completely encircled several times and this may check the growth although the vascular tissue is not directly attacked. When a plant not yet fully grown is affected in this manner, a mine which encircles the stem may interfere with the balance of metabolism to such an extent that growth ceases in the affected area. This results in a constriction of the stem and weakening of the vascular tissues, and such plants are sometimes blown down by high or even moderate winds. Partial or complete fracture occurs where the tissues have been weakened.

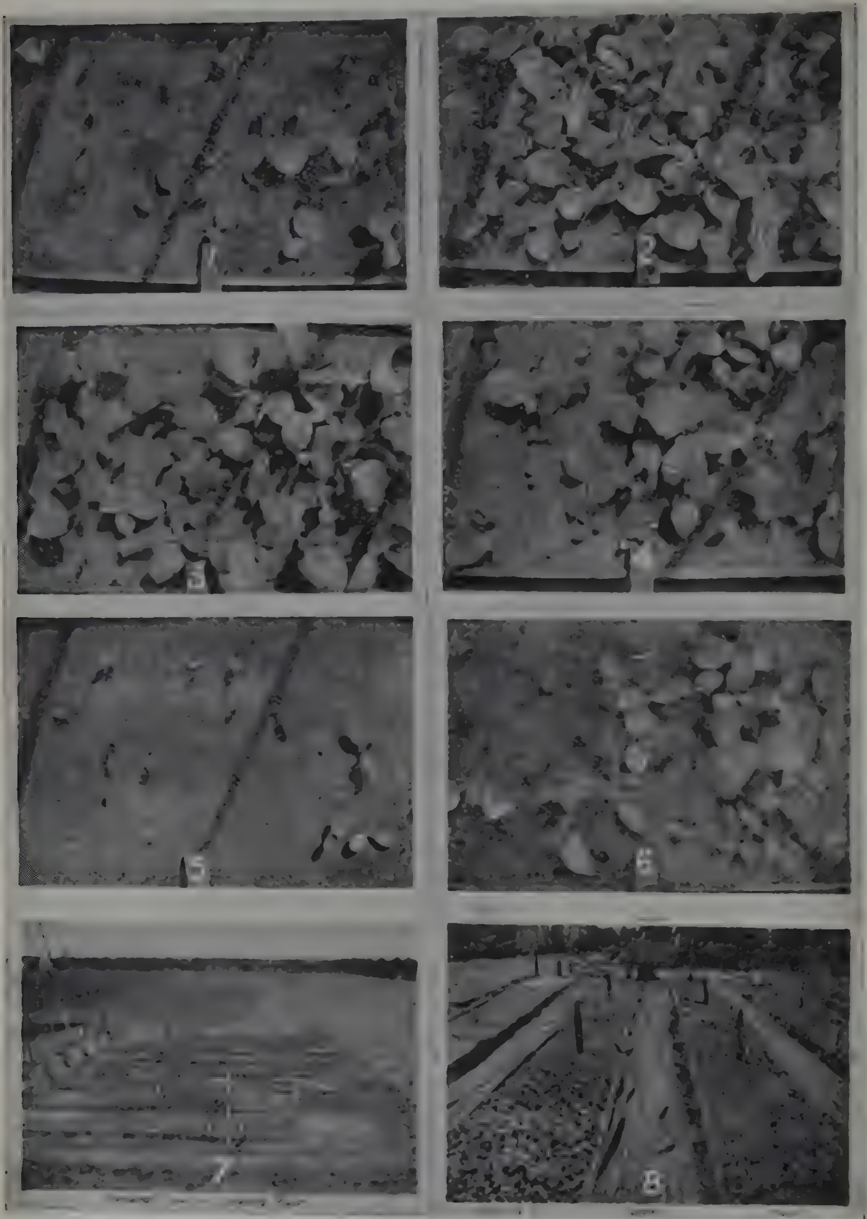

PLATE 9.

EXPERIMENTAL SEED-BEDS AT MAREEBA.

Figs. 1–6.—Seed-bed A. Plants pricked out at six weeks, then treated for three weeks. Fig. 1.—Control. Fig 2.—Dusted daily with 50 per cent. lead arsenate. Fig. 3.—Sprayed twice weekly with colloidal copper. Fig. 4.—Sprayed twice weekly with lead arsenate 1½ oz. per gallon. Fig. 5.—Sprayed twice weekly with sulphonated white oil. Fig. 6.—Same as Fig. 2. Fig. 7.—General view of experimental seed-beds looking west. Note bare patches representing C plots in seed-beds B, C, and D, compared with growth in sprayed plots. Taken when oldest plants nearly eight weeks old. Fig. 8.—Seed-beds B and C looking south, taken at seven and a-half weeks. Note definite failure of plants in C plots due to attacks of blue mould and leaf miner in Bed B, but to leaf miner alone in Bed C.

During severe infestations in the seed-beds seedlings may be completely destroyed as the larvæ consume the greater part of the chlorophyll bearing tissue of attacked plants (Plate 9). A single larva may damage more than one plant by travelling from seedling to seedling, as has been described in an earlier paragraph. A number of instances have been observed where the leaf miner has been responsible for the complete destruction of seed-beds. In most of the northern seed-beds there are usually numbers of plants attacked by this species even though they may not be completely destroyed. The check to the young plants, if infested before being transferred to the field, acts as a handicap at a time when growth should be rapid and unhampered.

When the seed-beds have been severely infested or if for any other reason there is a large population of moths present when the seedlings are transplanted, heavy losses of young plants in the field are to be expected. The seedlings seldom make very much growth until the rooting system has recovered from the injury inseparable from transplanting, and such recovery and renewed growth may not occur for one or two weeks or even longer. If attacks are initiated during this period of suspended growth the young plant has but a slender chance of recovery. For this reason planting out late in the season on farms where the leaf miner is already well established is seldom successful. An unsatisfactory and unprofitable stand may be the sole result of several replantings under such conditions.

If the onset of an infestation in the field is delayed until the period of suspended growth is past and the plants have resumed vigorous growth, the risk of total destruction by leaf miner is considerably reduced. When attacks are initiated on vigorously growing plants in the field direct losses are usually confined to the lower leaves (Bondar, 1925, and Edwards, 1929). Occasionally, however, under North Queensland conditions all the leaves on the plant, even as high as 5 feet from the ground, may be mined, and in such cases the losses are very severe.

In addition to such direct losses as have been described above, the pest also does some indirect damage, particularly in the seed-beds. It has been shown that viable spores of tobacco blue mould, *Peronospora tabacina* Adam, can be carried by the adults, and the species is therefore probably instrumental in spreading this disease (Angell, Hill, and Currie, 1930).

[TO BE CONTINUED.]

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Inoculation of Cattle against Redwater and Anaplasmosis.

By JOHN LEGG, D.V.Sc., Animal Health Research Station, Oonoonba, Townsville, Queensland.

RECENT research work on the problem of tick fevers of cattle has caused us to radically alter our views in connection with these diseases. It was previously thought that only one tick-borne blood parasite was present in Queensland, but we now know that there are several. These various parasites have been recently separated from each other in different carrier animals and their individual effects on the animal have been studied. In addition, an attempt has been made to procure a vaccine which could be applied in the field as a single inoculation but which would protect against all forms of tick fever found in Queensland.

In preparing the vaccine, which it is now proposed to distribute from the Animal Health Station, Yeerongpilly, use has been made of a mild strain of anaplasm, which has recently been imported from South Africa. This strain has been combined with one of the organisms causing redwater of cattle in Queensland so that the vaccine actually contains two different blood parasites.

The Vaccine.

The vaccine is intended for use against redwater and anaplasmosis, and contains two blood parasites capable respectively of setting up these diseases. The incubation period of the two parasites is different; the redwater parasite, known as the piroplasm, produces a reaction between the seventh and fourteenth day, while the anaplasm reaction does not usually commence before the beginning of the third week and often a month or six weeks passes before it occurs. The redwater parasite used is one obtained from naturally infected Queensland cattle, while the anaplasm is a specially mild strain introduced from South Africa. This strain was imported because it was found that the anaplasm present in naturally infected cattle in Queensland was too virulent for use in the vaccine, while the South African strain produces only a mild reaction, and after recovery leaves a measure of resistance to the local anaplasm.

The vaccine should be inoculated as soon as received. It will only keep for three days, so that the sooner the injection is made the better. Any vaccine having an offensive smell should be immediately returned to the laboratory. It should not be used later than the date given on the label. Dose, 5 c.c. for animals of any size or age.

Use of the Vaccine.

Redwater and anaplasmosis are found throughout the tick-infested area of Queensland. As a rule calves bred in the tick-infested zone become infested with ticks soon after birth and infection with the blood parasites of redwater and anaplasmosis naturally follows. Since calves have a definite age resistance to these blood parasites the reaction produced is very mild. They recover quickly without having shown any ill effects, and after recovery are "immune." Continual infestation with ticks throughout the lifetime of the animal means continual reinfection by the blood parasites, and so the immunity is retained.

Cattle born and bred in areas free from ticks have not this resistance or "immunity," and hence it is necessary to vaccinate these cattle before introduction to tick-infested districts.

It should be noted also that there are many areas in Queensland, particularly in the best class of dairying country, where the continual destruction of the tick by dipping has so reduced their number that the cattle grow up without any immunity and hence are susceptible to these diseases.

Instruments Required.

A hypodermic syringe 5–10 c.c. capacity with suitable hypodermic needles.

The syringe should be taken to pieces and with the needles boiled for ten minutes. The water is then allowed to cool and the syringe fitted together, care being taken that all the parts fit properly and are in good order.

The operation is performed by injecting the appropriate dose of blood under the skin, usually behind the shoulder, care being taken to wash the area thoroughly, before injection, with a suitable disinfectant (2½ per cent. carbolic).

Where large numbers of cattle have to be inoculated a suitable apparatus consisting of rubber tubing, valves, hypodermic syringe, and needles fitted to a convenient handle can be supplied.

Precautions Following Inoculation.

As already stated there are two reactions. The first, or redwater, takes place in seven to fourteen days, the second, or anaplasm, about a month after inoculation. During the redwater reaction it is advisable to take the temperature, particularly if it is an aged imported beast. If the temperature rises above 105 degrees and/or the animal is distressed, appropriate means should be taken to control the reaction. This can be done by the use of piroblue. This drug has only recently been introduced into Australia for the treatment of redwater, although it has been in use in some of the other countries of the world for several years. The dose of piroblue recommended is 1 gram for animals of all ages. The drug is dissolved in 100 c.c. (half a breakfast cup) of clean water which has been *previously* boiled and then allowed to cool to blood heat. The solution is then injected directly into the jugular vein and should always be prepared just before it is used, although the drug kept in the dry state will remain potent for a very long period.

The anaplasm reaction usually produces a high temperature (which can be detected by the thermometer). Condition is usually lost and in severe cases there may be some anaemia, but no special treatment is required beyond proper feeding and in the case of valuable animals proper housing.

General Recommendations.

After recovery from the two reactions animals can be exposed in tick-infested country. Under ordinary circumstances they will become infected with the two forms of blood parasites which produce redwater. In addition they will become infected with the local anaplasm, but their resistance to all these parasites should be sufficient and they should not show any signs of illness. It must be recognised, however, that the immunity is only relative. Valuable animals particularly should therefore be carefully attended to and watched for the first few weeks after being exposed to ticks and the following points require attention:—

(1) The animals should not be driven or railed over long distances, or exposed to hardships—i.e., drought conditions.

(2) Heavy tick infestation should be avoided. If the country is heavily infested frequent dipping is necessary.

(3) Bulls should not be given too much work during the first few weeks.

Special Recommendations.

In some areas, particularly the best dairying districts of Queensland, there are farms where very few ticks exist. This state of affairs is frequently due to the zeal of the owners who desire to see their animals as free from ticks as possible and who consequently dip their cattle at frequent intervals. Under such circumstances it is quite possible to find farms where ticks are very difficult to discover. Cattle bred on these farms may thus reach a stage of life where their age-resistance has been reduced or lost before actually becoming infected with the redwater or anaplasm parasites. Outbreaks of redwater and anaplasmosis are, therefore, likely to occur, and, unfortunately, some of the worst outbreaks during recent years have been among dairy stock.

Owners, therefore, are specially advised not to persist in dipping until all the ticks have been killed out. For the sake of the young stock a minimum number of ticks should always be present. If there is any doubt as to the immunity of their animals owners are advised to inoculate.

In carrying out inoculation, owners should note the following:—

(1) Young cattle under one year and in store condition are less susceptible than aged, fat animals.

(2) Pure breeds are more susceptible than cross breeds.

(3) Inoculation of pregnant cows should be avoided as they are likely to abort subsequently.

(4) Milk yield in heavy milkers will be considerably reduced during, and for some days after, the reaction.

Two Forms of Redwater Parasites.

There are two types of redwater parasites in Australia. Both these parasites are entirely independent of each other, although in outbreaks of redwater in the field, they may be associated. One of these types of blood parasites, known as the babesiella, is not susceptible to piroblue, and unfortunately appears to be very common. If piroblue is used in cases of redwater outbreaks in the field without a previous correct diagnosis being made, results are for this reason likely to be disappointing. Owners therefore are specially advised to consult their nearest Stock Inspector, who will assist and advise in taking blood smears from acute cases for their despatch to the laboratory.

It should be noted that the type of redwater parasite used in the vaccine supplied, and known as a piroplasm, gives considerable resistance to infection with the second type (the babesiella).

Issue of Piroblue.

Owners are advised to keep piroblue on hand when inoculating valuable stock with the vaccine supplied by the laboratory.

Guarantee.

Vaccine is issued only at the risk of the owner. No guarantee can be given that losses will not occur from the inoculation; neither can an assurance be given that surviving animals will be immune.

Where and When Obtainable.

Vaccine can be obtained from the Animal Health Station, Yeerongpilly, Brisbane. Order should be placed so that the blood can be despatched on specified days (every Tuesday).

CARE OF THE CREAM SEPARATOR.

The quantity of cream which is lost through worn and uncared for separators is not always realised by the dairy farmer. Seeing that the cream is the source of livelihood, every care and attention should be given to the machine, and proper adjustment made so that it will render the best service. A common cause of trouble is due to the failure to keep the separator perfectly level and securely fastened down. When installing the machine select a solid foundation and see that the bolts get a firm hold. Besides causing wear of the gearing the effect of a shaky machine is that the vibration allows of the remixing of the cream and the lighter liquid after they have been separated. The separator should be lubricated with good quality oil of the correct grade, as recommended by the suppliers of the machine. The oil in the bath should be changed occasionally. Owing to the high rotative speeds of the bowl, the gearing and spindle bearings have to be very accurately made, with fine clearances. If these clearances get much greater through wear vibration is set up, resulting in less efficient skimming.

All separators should be gone over at least once a year and all worn parts replaced. After an overhaul the user should get a test of the skim milk to see the adjustments and the cream screw setting are correct, and if the butterfat content is higher (over .03 of 1 per cent.) other adjustments should be made. If the screw is adjusted for a very rich cream there is a tendency to decrease the efficiency of the separator, and further losses through the cream sticking on the sides results. Bad skimming, whilst frequently due to the bowl out of level or wear and vibration, may be due to incorrect speed. This is important.

A lowering in speed of ten revolutions per minute below that recommended by the maker may affect the butterfat content of the skimmed milk to double the quantity. The machine should be driven evenly and smoothly. Driven by an electric motor or an oil engine of the throttle governed type, better skimming results than hand drive are obtained for the reason that the speed is maintained at its speed. The machine should be started up slowly, gradually increasing in its speed up to normal, or damage or excessive wear to gearing is occasioned. For a power drive a special friction pulley should be used to obtain this end, or if fast and loose pulleys are employed, the belt should be moved across slowly.

The milk should not be allowed to get too cold before separating. In winter its viscosity would get greater, making it harder to separate, and thus decrease the skimming efficiency of the separator. The fat separates easier at 90 degrees. Thorough washing is an important factor in efficient separation. This should be done every time the machine is used. Any collection of thick material in the cream and milk passages and bowl shell prevents complete separation. The bowl should be taken apart and all the fixtures properly cleaned immediately after each separation. Too often the farmer omits to give the separator the attention it deserves, and to watch the important points mentioned. Proper care in the running of the machine will prolong its life and reduce wear. Corrections, too, are usually quite simple, and replacements inexpensive, but in the case of a badly worn machine it is cheaper and surer to purchase a new machine. A worn-out separator is a bad proposition.

Tick Fevers of Cattle in Queensland.

By C. R. MULHEARN, B.V.Sc., Animal Health Station, Yeerongpilly.

TICK fever and redwater are the popular names applied to a number of closely related diseases of cattle caused by extremely small blood parasites. These parasites, under natural conditions, are transmitted by the cattle tick (*Boophilus microplus*). Hence the diseases only occur within the tick-infested areas.

xii 116 The female cattle tick develops on one animal reaching maturity in approximately twenty-one to twenty-five days. It then drops to the ground and lays from 2,000 to 3,000 eggs. The young larval ticks which develop from the eggs remain on the ground until they get a chance to attach themselves to other cattle. If the first animal was suffering from an acute attack of tick fever or was a carrier of any of the tick fever organisms, it would infect the female tick. The tick fever blood parasites pass through the egg stage into the larval ticks of the next generation. These in turn would infect the cattle to which they become subsequently attached and, if susceptible, such animals then suffer from an attack of tick fever.

There is some evidence to suggest that at least one form of the disease may also be transmitted on occasion from animal to animal by the agency of blood sucking flies.

Economic Importance.

This group of diseases is of very great economic importance to the Queensland cattle industry. Their presence in the tick-infested country greatly handicaps the free movement of cattle from the tick-free areas into the coastal country. For economic reasons it is essential to have the principal sale yards and killing centres on the coast, and as all the coast country in Queensland is tick-infested considerable inconvenience is experienced each year when cattle are forwarded from the inland tick-free areas to the tick-infested coastal areas for sale or slaughter.

Another form of loss and inconvenience is incurred when stud cattle are introduced from clean districts into the tick area. If these cattle are forwarded direct to the holdings they very frequently develop an attack of tick fever, often with fatal results, and consequently it becomes necessary to inoculate them so that they will pass through mild reactions. After recovery such animals are highly resistant to subsequent infection by these parasites per medium of the tick.

Frequently losses occur in cattle in that area of country situated between the definitely tick-infested and definitely tick-free country. Owing to seasonal and other conditions, the cattle on such an area may not be exposed to ticks for several years, and these stock then become susceptible to these blood parasites. When they are again exposed to ticks in a favourable season there may be severe losses.

Losses are also continually occurring in cattle bred within the tick zone. This occurs particularly in areas where dry seasons cause a diminution in the number of ticks or where these parasites have been killed out by frequent dipping. The presence of these diseases in such districts under the present conditions in Queensland render the abolition of ticks from individual areas inadvisable, for if such is carried out the cattle lose their resistance and when again exposed to ticks they may develop a severe form of the disease resulting in heavy losses. Consequently it is necessary to either regularly inoculate these cattle or to expose them continually to a certain amount of tick worry to maintain their resistance.

Susceptibility to these Diseases.

The severity of these diseases varies considerably with the age of the individual animals. Young animals possess a natural resistance to all forms, and consequently when infected they usually show only a mild attack, but this resistance gradually diminishes as the animal ages so that at one year old a severe attack may be experienced. As a general rule well-bred heavy beef cattle are more susceptible than the lighter grade animals.

Almost all young cattle when exposed to ticks pass through mild attacks of the various forms of tick fever and acquire a premunition which gives them a resistance against subsequent infections. Under normal circumstances, whilst continually exposed to tick infestation, this resistance is maintained during the life of the animal.

The condition of premunition does not give a solid immunity, but it brings about a state of balance between the animal defences and the tick fever organisms, which are continually carried in the body of the animal. If, owing to unfavourable circumstances such as sudden exposure to heavy tick infestation, starvation, overwork, or other diseases, the animal's resistance is lowered, the body defences may be unable to cope with the tick fever organisms. The latter then again assume control and the animal has a relapse to one or other or possibly all of the different forms of tick fever. This fact partly accounts for a number of the cases of tick fever which occur in cattle bred in the tick-infested areas.

If an animal is not constantly exposed to infestation by ticks the body defences gradually overcome the organisms which disappear from the animal's body. When the organisms have disappeared, the animal again becomes susceptible and will develop an attack of tick fever when re-exposed to infection.

The Causal Organisms.

For many years it was considered that tick fever in Australia was caused by a single blood parasite, but recent investigations carried out by the Council for Scientific and Industrial Research at Townsville have shown that there are at least four different parasites (1). All these blood parasites are quite independent of each other and in any tick-infested zone one, two, three, or four, or any combination of these forms may be present.

Scientifically the parasites are known as—(1) *Piroplasma bigeminum,* (2) *Babesiella argentinum,* (3) *Anaplasma marginale,* and (4) *Theileria mutans.*

All these organisms were undoubtedly introduced into Australia with the ticks many years ago.

Symptoms.

There is a marked variation in susceptibility in individual animals. Some animals pass through an attack of tick fever without showing any obvious symptoms, whilst other animals are affected with a very severe attack which may cause pronounced symptoms and even death. The symptoms also vary according to the organism causing the disease.

P. bigeminum.—This parasite is widely distributed throughout the tick-infested areas. For many years it was thought to be the only tick-transmitted blood parasite of cattle. Recent investigations have shown that it is probably not the most common cause of serious outbreaks of tick fever in the field.

Under natural conditions the incubation period is three or four weeks. When artificially produced by blood inoculation the incubation period is much shorter and is about one week.

Usually the first sign of the disease is manifested by a rise in temperature. This, however, may not be noticed unless temperatures are regularly taken with a clinical thermometer. The temperature gradually rises over a number of days until it reaches a maximum which may vary from 104° to 108°F. A sudden drop in temperature, without special drug treatment, is a bad sign, as this sudden lowering of temperature frequently precedes collapse and death.

If the affected animal is in the open it frequently leaves the rest of the mob and seeks shade when its temperature is high. It next ceases to cud and refuses to eat. The coat may appear ruffled and the ear droops. The breathing becomes rapid and jerky. If the animal is driven it may stagger and show a weakness of the hind quarters. In dairy cows the milk supply is greatly diminished. Constipation, which is present in the early stages, may be followed by diarrhœa as the disease advances. In severe cases changes are noticed in the urine which becomes a dirty reddish colour, hence the name redwater. In most fatal cases death occurs within a week of the first symptoms.

The post mortem appearances are marked by pallor of the mucous membranes due to poverty of the blood. The liver is enlarged and of a bronze colour and the gall bladder is distended with dark thick bile. The spleen is enlarged and the kidneys are often dark in colour. The bladder usually contains a quantity of dark reddish urine.

B. argentinum.—This parasite appears to be frequently responsible for outbreaks of redwater in the field.

The incubation period, symptoms, and post mortem appearances are somewhat similar to those seen in cases of tick fever due to *P. bigeminum.* However, red urine may not always be present in this form of tick fever, while jaundice is often a very marked feature. The kidneys are often enlarged and very dark in colour.

It is therefore impossible to differentiate between these two forms of tick fever without the aid of a microscope. For this reason stock owners should forward blood smears from sick cattle and smears from the cut surface of the kidney, liver, and spleen from fatal cases to the Animal Health Station for diagnostic purposes.

A. marginale.—This blood parasite is known to be widely distributed throughout the tick-infested area of Queensland. Infested cattle do not usually show high fever or great distress, but there is a gradual wasting and loss of condition. In fatal cases the animal becomes so weak that it goes down and death follows from gradual exhaustion. Most owners do not recognise this condition as being a form of tick fever for there may be no high temperature and there is no red urine. Post mortem appearances are marked by great wasting, with pallor and often jaundice.

T. mutans.—This blood parasite is very widely distributed throughout the tick-infested area. Up to the present there has been no evidence to show that it causes any harm.

Treatment.

General treatment consists in good nursing. The animal should be rugged in cold weather and made as comfortable as possible. The appetite should be tempted at frequent intervals with freshly-cut green feed and bran mashes. A liberal supply of water in which potassium nitrate at the rate of 1 oz. to 2 gallons has been dissolved should be available at all times. If the animal is carrying a large number of ticks and it is only in the early stage of the disease it should be sprayed, but if the disease is well advanced spraying is not advisable and as many ticks as possible should be picked off.

The animal must be kept quiet and disturbed as little as possible. If driven, the fever may be aggravated and cause collapse and death.

Drug treatment has been found to be very effective for that type of tick fever caused by *P. bigeminum*. Piroblue, which was introduced by the South African authorities, and is now widely used in that country, has been found to be extremely effective in controlling this form of the disease in Australia. Supplies with directions for use can be obtained at the Animal Health Station, Yeerongpilly. The treatment consists of injecting 1 gram of piroblue dissolved in 100 cc. of water into the jugular vein.

The sick animal, even when suffering from a severe attack of the disease, usually recovers within twelve hours of treatment, in which time the temperature will fall to normal and the number of organisms in the circulation will be greatly diminished. The drug should be given before the case becomes too far advanced, for if left too long the animal may die before the drug can produce its beneficial results. Any cases showing red urine should be looked upon as severe and should be treated without delay. It must be borne in mind, however, that red urine is also a symptom of babesiellosis, the second form of redwater against which piroblue is not effective. Hence to avoid disappointment and a wrong impression of the efficacy of the drug it is always advisable, where possible, to have a correct microscopic diagnosis made before the drug is used.

Preventive Inoculation.

Preventive inoculation is most frequently carried out to give a protection to valuable stock which are being transferred from tick-free to tick-infested country. It is also used for cattle which are maintained in lightly tick-infested country to ensure that they retain their resistance against the different forms of the disease.

This inoculation consists of an injection of freshly drawn blood from a specially prepared animal into the susceptible animals.

As previously pointed out there are three organisms, viz., *P. bigeminum, B. argentinum, and A. marginale,* capable of producing a severe attack of tick fever, and the object of preventive inoculation is to give the animals as mild an attack as possible and at the same time give a resistance against these three organisms.

Recent work at Townsville has indicated that animals which have recovered from an attack of *P. bigeminum* have considerable resistance to *B. argentinum*(2). If a severe reaction follows the preventive inoculation with *P. bigeminum,* it can readily be controlled with piroblue.

The third form of tick fever, which is caused by *A. marginale,* has been found difficult to deal with in Australia, because the local parasites when inoculated into susceptible cattle produce too severe a reaction, and up to the present no suitable drug has been discovered which can influence the course of this form of tick fever. For this reason a milder form of the parasite known as *A. centrale* has been introduced from South Africa. Experiments have shown that Australian cattle tolerate this parasite well, and after recovery the great majority of them show considerable resistance to infection with *A. marginale.*

It is intended, therefore, to incorporate this South African parasite in the vaccine which will be supplied by the Animal Health Station, Yeerongpilly. Such vaccine issued in the future will therefore contain two blood parasites, viz., *P. bigeminum* and *A. centrale.* The first produces a reaction about the end of the first week, and, if too severe, can be controlled by piroblue, while the second produces a reaction which occurs about one month after inoculation and which will be found to be quite mild. This vaccine will give a protection against all forms of tick fever.

Blood Supplied for Inoculation.

Blood will be supplied from this Station for inoculation purposes. As the organisms in the drawn blood do not survive for more than a few days and as the possibility of a successful reaction diminishes as the blood becomes older, it is essential that the blood should be used as soon as possible after it is drawn. Blood which is more than three days old should not be used. In order that all blood may be supplied under the most suitable conditions cattle will only be bled and blood forwarded on certain specified days. The dose recommended for all cattle is 5 cc.

Cattle carrying the recommended organisms will be prepared as bleeders and supplied from this Station. It must be borne in mind, however, that when these specially prepared bleeders become exposed to ticks they will probably soon become infected with the other organisms which may render them dangerous for use as bleeders.

If a specially prepared bleeder is to be used over a considerable period of time on a property it must be received and maintained in a tick-free condition. Under such conditions the animal only remains infective for about three months.

The most suitable time to inoculate cattle in the tick-infested areas is in the spring or early summer—i.e., before the commencement of the wet season. Cattle which are continually exposed to ticks do not require to be inoculated, but cattle which are running on country where ticks are comparatively rare should be inoculated each year. All clean cattle which are moving from the clean to tick-infested districts should be inoculated at least two months before they are moved.

The operation of inoculation is carried out by injecting the dose of blood into the tissues under the skin. The most suitable situation for inoculation is just behind the shoulder. The area is prepared by clipping off the hair and then washing with a reliable antiseptic solution. A 10 cubic centimetre hypodermic syringe and a few stout hypodermic needles are required. The bottle containing the blood is opened and the syringe, after sterilizing, is filled and the inoculation is carried out immediately. When a bottle of blood is opened it should be used straight away. It may be convenient to pour the blood into a clean dry cup which has been previously sterilized by boiling in water. The syringe and needles should also be sterilized both before and after the operation.

Two reactions should follow the inoculation of susceptible cattle. The first in from six to fourteen days and the second in from twenty to forty days. If, however, the inoculation is performed on cattle in the tick area the animals may not react or the reaction may be so mild that it is not noticed.

Cattle which are reacting should be treated as recommended. Cows heavy in calf should not be inoculated, for a severe reaction may bring on abortion. Cattle which have been inoculated should be kept as free of ticks as possible for six to eight weeks. After inoculated animals are exposed to ticks they should be carefully watched for about one month to ensure that they are resistant. If no attack occurs within this time the inoculation has been successful and, under normal circumstances, the animal will remain resistant.

All blood forwarded from this Station is taken from specially prepared animals, but no responsibility can be accepted by the Department for any mortality following inoculation, neither can any guarantee be given that the animals that have reacted will remain resistant to all the tick fever organisms.

REFERENCES.

(1) Legg, J. (1933)—The Occurrence of *Anaplasma marginale*, Theiler, 1910, in North Queensland. Pamphlet No. 38, Council for Scientific and Industrial Research, Commonwealth of Australia.

(2) Legg, J. (1935)—The Occurrence of Bovine Babesiellosis in North Australia. Pamphlet No. 56, Council for Scientific and Industrial Research, Commonwealth of Australia.

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The Feather Mites of Poultry.

Ind. (T.h.)

By F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

SEVERAL species of mites have been recorded as associated with the feathers of poultry. Some of these are definitely parasitic in habit and obtain their food by piercing the skin and sucking up the blood and lymph. To this group belong the Gamassid mites of the genera Dermanyssus and Liponyssus.

There is a single species of the genus Dermanyssus which normally infests poultry, namely the red mite, *D. gallinæ* Redi. The red mite is found on all classes of poultry and appears world-wide in its distribution. It occurs on its hosts only at such times as it requires food, and lays its eggs in sheltered cracks and crevices in the fowl house.

In the second genus, Liponyssus, two species are known to attack poultry—namely, the northern fowl mite, *L. silviarum* Canestrini and Fanzago, and the tropical fowl mite, *L. bursa* Berlese. Both these species are found on the birds in all stages of their life cycle, their eggs being laid on the feathers. The northern fowl mite reaches its highest development in temperate climates and is well known in Europe and North America. In warmer countries it is replaced by the tropical fowl mite which is very prevalent in such countries as the Southern United States, South Africa, South America, and Queensland.

There are other species of mites found on the feathers, which do not appear to be parasitic, but are said to live and feed on the feathers only. These are the true feather mites and belong to the family Analgesidæ. The members of this family occur on a large number of birds and do not appear absolutely restricted in their choice of host, as a single species may be found on many different birds. They may be found on or among the feathers or in the quill. Some species occur only on the flight feathers, others on the body feathers, and others again among the feathers of the head and neck. The Analgesidæ are closely related to the Sarcoptidæ or itch mites and lay their eggs usually on the barbs of the feathers. In some species there is a migratory nymphal stage. Fourteen species belonging to this family have been recorded from domestic birds.

One of the most interesting is the mite *Falculifer rostratus* Buchholz, which is found among the feathers of the pigeon. Under certain conditions the hypopial nymph penetrates into the subcutaneous tissues and has been found in large numbers in the thymus gland. Sweet (1908) has recorded this species from the pigeon in Australia (Proc. Roy. Soc., Vic., Vol. XXI., p. 523). Three further species are recorded from the pigeon *Falculifer cornutus* Trouessart, *Analges bifidus* Nitzsch, and *Pterophagus strictus* Mégnin.

Megininia cubitalis Mégnin is found among the body feathers of fowls and turkeys. Recently the writer's attention was directed to a species of mite occurring in large numbers among the body and wing feathers (excluding the flight feathers) of some Australorp pullets which are being used for nutritional experiments at this Station. For some time these birds had been addicted to the vice of feather picking. Extremely heavy infestations with this mite were observed on the majority of the birds, and it appeared as though the association had resulted in an irritation causing the birds to pick out the feathers, the areas affected being chiefly the neck, breast, rump, and back. Very few mites were observed actually on the skin, being practically confined to the barbs of the feathers adjacent to the shaft. The species was identified as *M. cubitalis.* This, so far as can be ascertained, is the first record of the presence of a species of this genus on poultry in Australia.

A second species, *M. columbae* Buchholz, has been recorded from the pigeon, fowl, canary, and a number of other birds, and a third species, *M. velata* Mégnin, from ducks. Wickware has written of a very unusual case of scabies associated with a species of Megninia in a flock of fowls in Quebec, Canada. (Jour. Paras., Vol. VIII., 90-91.) In the affected birds a dried exudate and crusts were prominent on the combs, wattles, and face. The eyelids were glued together with the exudate and the birds could not eat. Scrapings of the crusts revealed large numbers of a mite which was determined as *M. gallinula* Buchholz. This species was first described from the spotted crake, *Ortygometra porzona,* in Europe.

The feathers of the fowl may also be infested by a species of *Pterolichus, P. obstusus* Robin, while *Microspalax chayani* Trouessart is known to be fairly common on the feathers of the turkey.

Two species of Dermoglyphus are recorded as inhabiting the quills of the feathers of the fowl, guinea fowl, and turkey, namely *D. minor* Nörmer and *D. elongatus* Mégnin.

Two very minute species of mites are found among the down and on the skin of the fowl, *Epidermoptes bilobatus* Rivolta and *Rivoltasia bifurcata* Rivolta. On occasions when the infestation with these two species of mites is heavy an intense pityriasis may be caused. Skin disease characte [illegible]

Three species belonging to the family Chyletidæ have also been recorded as being associated with the feathers of poultry. *Syringophilus bipectinatus* Heller occurs in the quills of the fowl, in which it is said to feed on the external cones of the feathers, while *S. columbae* Hirst has been found in the quills of the pigeon. The third species, *Sarcopterinus nidulans* Nitzsch, has been recorded from a number of birds, including pigeons. It lives in colonies in the follicles of the feathers and gives rise to tumours or cysts in the skin.

Another species which may be seen among the debris attached to the shafts of feathers is *Cnemidocoptes gallinae* Railliet. This mite burrows into the skin alongside the quills of the feathers, causing an itching inflammatory condition and giving rise to the disease known as "depluming itch."

◆

LITTER RECORDS.

Four litters of pigs were officially recorded by the Department recently for stud pig breeders; a summary of results follows:—

Owner.	Breed.	Date of Birth.	Number Reared.	Weight at Eight Weeks.	
				Total (lb.)	Average (lb.)
Hibberd Bros., Indooroopilly	Large White	17-8-35	10	327	32·7
M. G. Bayliss, Maleny	Large White	23-8-35	8	399·5	49·9
H. O. Rees, Maleny	Middle White	26-8-35	9	282	31·3
R. Turpin, Lowood	Wessex Saddleback	14-9-35	10	375	37·5
A. G. Stewart, Gympie	Large White	4-10-35	13	488	37·5

Grass Tetany.

By C. R. MULHEARN, B.V.Sc., Animal Health Station, Yeerongpilly.

SEVERAL cases of Grass Tetany (also known as Lactation Tetany) in dairy cows have been reported to this Station during the past year. From the histories given it would appear that this disease has been present in Southern Queensland for some years. Cases have been investigated or reported from the Downs and the South Coast dairying districts, but it is probable that under favourable circumstances the disease may appear in other parts of the State. Experience both in Queensland and in other parts of the world indicates that grass tetany may be regional, for some districts are repeatedly affected whereas adjoining districts remain comparatively free.

Cause of the Disease.

The cause of the disease is not definitely known although several theories as to its nature have been put forward. It is now generally believed, however, that the most significant change is a disturbance of the mineral (chiefly magnesium) content of the blood. As previously stated the disease is chiefly seen in dairy cows. In many respects it is closely related to milk fever and some success has been claimed for the time honoured milk fever treatment, viz., inflation of the udder, in the treatment of grass tetany.

Cases are usually seen within a month of calving when cows are in heavy milk, but they may appear at any time during the milking period and they often coincide with the periods of heat. Outbreaks are usually associated with more or less continuous feeding on some quickly growing grass, herbage, or fodder crop, hence the name—grass tetany.

The Queensland cases have followed continuous feeding on growing oats and barley, or natural pastures in which a luscious growth of clover was present. One theory suggests that the increased milk production due to the ingestion of these succulent plants has proved too great a strain on the mineral portion of the blood, which cannot be recouped at the same rate from the body reserve, with the result that there is a disturbance in its mineral balance. This may occur although the animal may not actually be suffering from a general mineral deficiency.

A second theory suggests that the cause is dietetic, and that the quickly growing crops in certain localities are deficient in the necessary minerals and are also unbalanced as regards a suitable fodder for the animals concerned. In support of this theory it can be stated that the disease may occur in beef as well as dairy cows, and it has also been occasionally reported in bullocks and calves. The disease has also been responsible for heavy mortalities in sheep in Australia.

Symptoms.

The animals in which the disease is mostly seen are in good condition and they may even be in a fat or plethoric state. Poor animals are rarely affected. A history is often given that the cows were put into a paddock of luscious quickly growing feed from a fortnight to a month before the first cases occur. The outbreak may be confined to one or two animals or a large percentage (10 to 20 per cent.) of the herd may be affected. The number of cases depends to a large extent on the time of calving in conjunction with the access to the rich feed and also on the resistance of the individual animals. When a large number of cows calve shortly after being turned on to rich pastures in a susceptible area it is probable that several cases will occur.

The symptoms usually appear suddenly. In the most acute cases no sign of disease may be seen, but the cow may be found dead overnight in the paddock from no apparent cause. In the case of dairy cattle the symptoms sometimes occur shortly after the animal has been brought into the yard, or a short time after milking. The cow may appear normal whilst being milked, or at the worst it may be irritable and restless. A little later symptoms of tetany as evidenced by muscular spasms and twitchings may develop. The muscles of the head, neck, body, or limbs may be involved. There is usually a wild look in the eyes, which may roll about in their sockets, and the head may be held up stiffly or thrown about. The animal may walk round in circles in one direction, and twitching of the various muscles may occur. These spasms generally last about ten minutes, when the animal apparently recovers. The spasms may be repeated at frequent intervals and they generally become worse at each turn, until the animal may go down and show evidence of profuse sweating. The breathing becomes deep and rapid and the animal appears to be in great pain. Convulsions may follow during which there are usually uncontrolled leg movements. The animal then appears to become unconscious. It may succumb to this attack or it may later get up, and apart from being stiff it may go on feeding as if nothing had happened. The milk yield is usually diminished whilst the animal is showing evidence of the disease. The spasms may return after an interval of several hours if no treatment is carried out, and the animal will finally collapse and die. The disease is fairly fatal, and a large percentage of the affected animals will die if not treated at the first signs of symptoms.

Recovery or death usually takes place within a few days. The fatal cases are sometimes confused with Tympanites (blown), but there is no excessive gas formation or swelling of the left side in grass tetany.

Treatment.

It is most important that treatment should be carried out as soon as possible after symptoms are observed. Early treatment frequently leads to recovery, whereas the results of delayed treatment are often disappointing. As the disease is considered to be due to a disturbance of the mineral balance of the blood the most successful treatment aims at remedying this condition. In order to do this it is necessary to inject the requisite drugs directly into the jugular vein. The following mixture is recommended for intravenous injection:—

Magnesium chloride	½ oz.
Calcium chloride	1½ oz.
Sterile water	10 oz.

To carry out this treatment the jugular vein should be raised by means of a cord and a bleeding needle is inserted into the vein. The cord is then released and a piece of rubber tubing is attached to the needle and the mixture is either injected into the vein by means of a syringe or it is allowed to flow in by means of gravity. In carrying out this treatment it is necessary to ensure that no air is allowed to enter the vein and the apparatus should be carefully sterilized before use. This treatment is rather difficult for the untrained person, and it requires considerable practice before it can be successfully carried out.

A more simple line of treatment consists of drenching with the following mixture:—

Epsom salts	10 oz.
Aromatic spirits of ammonia	2 oz.
Ginger	2 oz.
Molasses or treacle	½ lb.
Water	1½ pints

If the cow is given this drench at an early stage of the disease recovery frequently follows. When muscular spasms and pain are pronounced relief may be afforded by the injection of 1 oz. of chloral hydrate dissolved in 1 pint of water well into the rectum by means of a rubber tube. In addition to the above treatment the cows should be kept under observation and made as comfortable as possible. They should not be milked out, but only a little milk should be taken at each milking.

Prevention.

It is much easier and more economical to prevent grass tetany than to attempt to cure it. In some districts where conditions are favourable and where the disease is seasonal and makes its appearance about the same time each year it should be expected, and the following preventive measures should be carried out:—

(1) A lick comprised of the following medicaments should be available to the cattle at all times:—

Sterilised bone meal	50 per cent.
Epsom salts	5 per cent.
Coarse salt	42 per cent.
Sulphate of iron	3 per cent.

(2) Cows which are due to calve and those which have recently calved should be carefully managed, and the period of time they are allowed to feed on quickly growing crops should be restricted.

(3) Epsom salts at the rate of 8 oz. to each 30 gallons should be added to the drinking water during the season when cases are expected to occur.

MEETING TROUBLES.

Some people never stop moaning. They spend their lives talking about their woes. Without a cross or two we would never develop character. It is the way that we meet our difficulties that we prove our worth. The weakling prays for deliverance; the stoic prays for strength. A strong character has no time for an easy life and a smooth path, but for power to conquer, ability to surmount, and grace to persevere. Difficulties, hard work, setbacks of any kind are the gist, spice, and joy of life, and things that make life interesting to the strong and troublesome to the weak. Work—mental and physical activity—is life's greatest gift to the one who really loves life, and a reverse is the jewel that makes that gift worth while—priceless.—C.C., Strathfield, in "Sydney Morning Herald."

Rations for Dairy Cows.*

E. H. GURNEY, Senior Analyst.

FEEDERS of dairy stock frequently forward to the Department lists of food material available to them, desiring to know how to make balanced rations from such material. On account of this it was thought that examples of rations made up with various feeds might prove useful, some of the examples being composed of foodstuffs named in the list mentioned above.

The Agricultural Chemist, Mr. J. Brünnich, has written a pamphlet entitled "Stock Foods," in which the objects of feeding, description and analyses of various stock foods, and the making up of rations are all very fully detailed, and with this information the dairy farmer can judge how to feed to the best advantage.

Modern experience has shown that rations with somewhat lower protein content than was previously considered necessary can be successfully used.

Examples of rations computed from analyses of feed-stuffs contained in "Stock Foods" are given below, and are in accordance with the feeding standards for dairy cows published in "Feeds and Feeding Abridged," by Henry and Morrison.

Professor J. K. Murray states that this standard is referred to in lectures in the Agricultural Course at the Queensland University.

HENRY AND MORRISON FEEDING STANDARD.

—	Digestible Crude Protein.	Total Digestible Nutrients.
Dairy Cows.		
For maintenance of a 1,000-lb. cow	0·700	7·925
To allowance for maintenance add—		
For each 1 lb. of 2·5 per cent. milk ..	0·045—0·053	0·230—0·256
For each 1 lb. of 3·0 per cent. milk ..	0·047—0·057	0·257—0·286
For each 1 lb. of 3·5 per cent. milk ..	0·049—0·061	0·284—0·316
For each 1 lb. of 4·0 per cent. milk ..	0·054—0·065	0·311—0·346
For each 1 lb. of 4·5 per cent. milk ..	0·057—0·069	0·338—0·376
For each 1 lb. of 5·0 per cent. milk ..	0·060—0·073	0·362—0·402
For each 1 lb. of 5·5 per cent. milk ..	0·064—0·077	0·385—0·428
For each 1 lb. of 6·0 per cent. milk ..	0·067—0·081	0·409—0·454
For each 1 lb. of 6·5 per cent. milk ..	0·072—0·085	0·434—0·482
For each 1 lb. of 7·0 per cent. milk ..	0·074—0·089	0·454—0·505

Then upon this standard a 1,000-lb. cow, yielding 25 lb. of milk of 3·5 per cent. fat, would require from a minimum amount of digestible crude protein 0·049 × 25 = 1·225 + 0·7 = 1·925 lb. to a maximum amount 0·061 × 25 =1·527 + 0·7 = 2·225 lb.; and this cow would require from a minimum amount of total digestible nutrients 0·284 × 25 = 7·1 + 7·925 = 15·025 lb. to a maximum amount 0·316 × 25 = 7·900 + 7·925 = 15·825 lb.

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* Published originally in the "Queensland Agricultural Journal" for December, 1931, and reprinted in response to a general request.—Ed. Q.A.J.

Again, a 1,000-lb. cow, yielding 25 lb. of milk of 4·0 per cent. fat, would require from 2·05 lb. to 2·325 lb. digestible crude protein, and from 15·7 lb. to 17·57 lb. total digestible nutrients,

The term "nutritive ratio" means that amount of digestible protein that exists in a feed compared with the amount of non-nitrogenous digestible nutrients in that feed. As fat is capable of producing more heat when digested than the other nutrients, the fat content in the following rations has been multiplied by 2·3 and the product added to the amount of digestible carbohydrate and fibre—this total divided by the digestible protein gives the "nutritive ratio" of the ration. Thus in No. 1 ration there is one part of digestible protein to six parts of other digestible nutrients.

When considering rations for animals it must be understood that other factors, beside the digestible crude protein and total digestive nutrients supplied to the animal, must be taken into account, such as succulence, palatability, and variety of feeds.

Proteins are very complex bodies, and different proteins yield different substances when digested, and a number of these different substances have to be supplied by the food for satisfactory nutrition. Therefore there is less chance of feeding an unbalanced protein content by using several feedstuffs than by using only one or two.

Rations are useful guides in feeding, but it must be noted that the analyses of the feedstuffs from which they are computed are averages only—that is to say, the composition of the feedstuffs varies according to soil and climate wherein grown, and particularly to the age of growth when harvested.

The legumes, such as lucerne, cowpea, clover, &c., are characterised by the high amount of phosphorus and lime (particularly lime) they contain. Therefore, when animals graze on grass pastures growing upon soils deficient in phosphoric acid and lime, the inclusion of a legume in a ration is of particular value to these animals supplying both protein and mineral matter. Bran is also relatively rich in phosphorus.

There is in very many cases a deficiency of phosphoric acid in the pasturage grazed by dairy stock. When such deficiency occurs the rations should be supplemented by the addition of from 2 to 4 oz. of a mixture of finely ground Nauru phosphate and salt. The mixture is in the proportion of two parts by weight of finely ground steamed bonemeal or calphos* or finely ground Nauru phosphate to one part by weight of salt.

Another consideration is the cost of a particular ration—whether it pays, when it is compared with the price obtained from the milk produced. But care should be taken that blame for unprofitable feeding is not placed upon the ration, when the fault is due to the cow. Some cows are capable of producing a large amount of milk, other cows are only capable of yielding a small amount of milk, even when supplied with ample well-balanced feed; such poor producers do not pay, and should be culled out from the herd.

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* Calphos is a bone preparation obtainable at the Brisbane Abattoir.

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK.

—	Dry Matter.	Digestible Nutrients.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
1—							
40 lb. Green Sorghum ..	8·0	0·48	0·08	2·32	1·36		
60 lb. Mixed Pasture (average)	12·0	0·53	0·12	3·48	3·01		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
	27·4	2·25	0·25	8·02	5·04	15·5	1 ÷ 6·0
2—							
65 lb. Green Sorghum ..	13·0	0·78	0·13	3·76	2·14		
7 lb. Lucerne Chaff ..	6·4	1·08	0·04	1·95	0·58		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·4	2·21	0·38	9·91	2·79	15·3	1 ÷ 6·1
3—							
45 lb. Green Sorghum ..	9·0	0·54	0·09	2·61	1·49		
13 lb. Wheat Chaff	11·3	0·27	0·12	3·39	2·04		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2¾ lb. Cotton Seed Meal (decorticated)	2·5	0·96	0·17	0·54	0·06		
2 lb. Molasses	1·5	0·02	..	1·15	..		
	27·9	2·16	0·43	8·90	3·69	15·2	1 ÷ 6·2
4—							
50 lb. Green Sorghum ..	10·0	0·60	0·10	2·90	1·70		
40 lb. Green Cowpea ..	8·8	0·64	0·12	2·92	1·14		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1¾ lb. Cotton Seed Meal (decorticated)	1·6	0·61	0·11	0·34	0·03		
4 lb. Molasses	3·0	0·04	..	2·29	..		
	26·0	2·26	0·38	9·66	2·97	15·3	1 ÷ 5·5
5—							
42 lb. Sorghum Silage ..	10·7	0·38	0·08	3·06	2·06		
9 lb. Lucerne Chaff ..	8·3	1·39	0·06	2·49	0·75		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·0	2·12	0·35	9·75	2·88	15·1	1 ÷ 6·3
6—							
35 lb. Sorghum Silage ..	8·9	0·31	0·07	2·55	1·71		
5 lb. Lucerne Chaff ..	4·6	0·77	0·03	1·38	0·42		
6 lb. Wheat Chaff	5·3	0·12	0·05	1·56	0·96		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
3 lb. Pollard..	2·7	0·41	0·09	1·62	0·06		
3 lb. Rice Meal	2·7	0·20	0·28	1·50	0·06		
	26·0	2·25	0·67	9·24	3·30	15·5	1 ÷ 6·2

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

—	Dry Matter.	Digestible Nutrients.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
7—							
65 lb. Green Maize	11·7	0·65	0·19	3·90	2·01		
8 lb. Lucerne Chaff	7·4	1·24	0·05	2·22	0·67		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·1	2·24	0·45	10·32	2·75	15·7	1 ÷ 6·3
8—							
54 lb. Green Maize	9·7	0·54	0·16	3·24	1·67		
10 lb. Wheat Chaff	8·7	0·21	0·09	2·61	1·57		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2¾ lb. Cotton Seed Meal (decorticated)	2·5	0·96	0·17	0·54	0·06		
	26·1	2·23	0·56	9·40	3·43	5·6	1 ÷ 6·3
9—							
30 lb. Maize Silage	9·0	0·30	0·09	3·21	1·56		
5 lb. Good Bush Hay	4·6	0·14	0·03	1·20	1·13		
4 lb. Cowpea Chaff	3·6	0·45	0·07	0·76	0·54		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
3 lb. Cocoanut Cake	2·6	0·40	0·21	1·19	0·20		
1 lb. Blood Meal	0·9	0·67	0·01	0·05	..		
	25·1	2·21	0·56	9·41	3·48	15·6	1 ÷ 6·4
10—							
35 lb. Maize Silage	10·5	0·35	0·10	3·75	1·82		
8 lb. Lucerne Chaff	7·4	1·24	0·05	2·22	0·67		
7 lb. Barley Meal	6·2	0·65	0·06	4·27	0·21		
	24·1	2·24	0·21	10·24	2·70	15·4	1 ÷ 6·0
11—							
80 lb. Green Paspalum	20·0	1·20	0·16	5·60	4·96		
6 lb. Lucerne Chaff	5·5	0·93	0·04	1·67	0·50		
	25·5	2·13	0·20	7·27	5·46	15·0	1 ÷ 1·6
12—							
67 lb. Green Paspalum	16·5	1·00	0·13	4·69	4·15		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2 lb. Cotton Seed Meal (decorticated)	1·8	0·70	0·13	0·39	0·04		
	23·5	2·22	0·40	8·09	4·32	15·0	1 ÷ 6·0
13—							
100 lb. Sudan Grass	22·0	1·50	0·10	7·50	3·80		
4½ lb. Lucerne Chaff	4·1	0·70	0·03	1·25	0·37		
	26·1	2·20	0·13	8·75	4·17	15·3	1 ÷ 6·0

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

——	Dry Matter.	Digestible Nutrients.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
14—							
100 lb. Sudan Grass	22·0	1·50	0·10	7·50	3·80		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1 lb. Cotton Seed Meal (decorticated)	0·9	0·35	0·07	0·19	0·02		
	25·5	2·22	0·22	8·90	3·92	15·3	1 ÷ 6·0
15—							
50 lb. Sudan Grass	11·0	0·75	0·05	3·75	1·90		
8 lb. Wheat Chaff	7·0	0·16	0·07	2·09	1·29		
4 lb. Lucerne Chaff ..	3·7	0·62	0·02	1·11	0·33		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
	26·1	2·12	0·38	9·38	3·64	15·5	1 ÷ 6·5
16—							
20 lb. Green Oats	4·6	0·28	0·08	1·30	0·98		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
10 lb. Wheat Chaff	8·8	0·21	0·09	2·61	1·61		
3 lb. Cocoanut Cake ..	2·6	0·40	0·22	1·19	0·20		
3 lb. Molasses	2·3	0·03	..	1·72	..		
	25·7	2·16	0·45	9·04	3·46	15·1	1 ÷ 6·3
17—							
25 lb. Green Barley	5·2	0·45	0·10	1·50	1·07		
13 lb. Wheat Chaff	11·4	0·27	0·11	3·40	2·10		
6 lb. Lucerne Chaff ..	5·5	0·93	0·04	1·67	0·50		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
3 lb. Molasses	2·3	0·03	..	1·72	..		
	26·2	2·12	0·40	8·92	3·76	15·2	1 ÷ 6·4
18—							
60 lb. Sugar-cane Tops ..	16·8	1·02	0·18	5·64	3·90		
10 lb. Cowpea Chaff ..	9·2	1·12	0·19	1·90	1·35		
	26·0	2·12	0·37	7·54	5·25	15·3	1 ÷ 6·4
19—							
50 lb. Sugar-cane Tops ..	14·0	0·85	0·15	4·70	3·25		
30 lb. Green Cowpea ..	6·6	0·48	0·09	2·19	0·84		
5 lb. Lucerne Chaff ..	4·6	0·77	0·04	1·38	0·42		
	25·2	2·10	0·28	8·27	4·51	15·2	1 ÷ 6·3
20—							
35 lb. Elephant Grass ..	7·0	0·32	0·07	2·03	1·75		
35 lb. Imphee	7·0	0·42	0·07	2·03	1·15		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	25·8	2·23	0·34	9·28	3·62	15·5	1 ÷ 6·1

RATIONS PER 1,000 LB. COW YIELDING 25 LB. MILK—*continued.*

—	Dry Matter.	DIGESTIBLE NUTRIENTS.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
21—							
35 lb. Elephant Grass	7·0	0·32	0·07	2·03	1·75		
35 lb. Imphee	7·0	0·42	0·07	2·03	1·15		
10 lb. Pumpkins	1·7	0·15	0·06	0·80	0·16		
7 lb. Lucerne Chaff ..	6·4	1·08	0·04	1·95	0·58		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	26·5	2·22	0·39	9·81	3·69	16·1	1 ÷ 6·4
22—							
65 lb. Mixed Pasture (average)	13·0	0·57	0·13	3·77	3·26		
9 lb. Lucerne Chaff ..	8·3	1·39	0·05	2·50	0·75		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	25·7	2·21	0·33	9·27	4·06	15·8	1 ÷ 6·3
23—							
15 lb. Poor Bush Hay ..	14·0	0·21	0·08	2·77	3·03		
10 lb. Pumpkins	1·7	0·15	0·06	0·80	0·16		
5 lb. Lucerne Chaff ..	4·6	0·77	0·03	1·38	0·42		
7 lb. Maize Meal	6·1	0·35	0·21	4·20	0·07		
1 lb. Blood Meal	0·8	0·66	0·02	0·06	..		
	27·2	2·14	0·40	9·21	3·68	15·4	1 ÷ 6·4
24—							
65 lb. Prairie Grass	15·1	1·95	0·26	4·29	2·75		
5 lb. Wheat Chaff	4·4	0·10	0·04	1·30	0·80		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
1 lb. Molasses	0·7	0·01	..	0·57	..		
	24·6	2·31	0·45	9·16	3·60	15·5	1 ÷ 5·9

It has been mentioned before that better results are obtained from rations composed of a variety of feed ingredients than from a ration made up with only one or two feedstuffs.

A very convenient method is to have on hand a quantity of the concentrates already mixed, and then to feed a certain quantity of this mixture with the roughage that is being used, increasing the quantity of the mixture used until it is noticed that no further increased milk production is obtained. An example of this procedure has been published in the "Live Stock Bulletin" under the heading of "4-2-1" plan; this meaning that a concentrate mixture is made of four parts maize meal, two parts ground oats, and one part linseed meal. The abovementioned paper recommends the following:—3 lb. of silage and 1 lb. of legume hay for every 100 lb. of the animal's body weight, and to gradually increase the amount given of the concentrate mixture until the cow is getting 1 lb. for every 5 lb. of milk produced. Thus a 1,000-lb. cow, yielding 25 lb. of milk, would be given a ration of 30 lb. maize silage, 10 lb. lucerne hay, and 5 lb. of the concentrate mixture—containing 2·26 lb. digestible crude protein and 13·6 lb. total digestible nutrients. This ration has the amount of digestible crude protein required by the Henry and Morrison standard, but has a somewhat lower amount of total digestible nutrients. Other concentrates can be used in this convenient manner.

For instance, a concentrate mixture could be prepared by mixing eight parts maize meal, one part bran, and one part cotton seed meal. This mixture would have the following composition:—

—	Dry Matter.	DIGESTIBLE.			
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.
	Lb.	Lb.	Lb.	Lb.	Lb.
1 lb. Concentrate Mixture	0·87	0·088	0·032	0·539	0·014
5 lb. Concentrate Mixture	4·3	0·44	0·16	2·69	0·07

If 4 lb. maize silage and 1 lb. lucerne chaff be used for every 100 lb. live weight, and 1 lb. of the above concentrate mixture for every 5 lb. of milk produced, the following will be the ration for a 1,000 lb. cow yielding 25 lb. of milk:—

—	Dry Matter.	DIGESTIBLE.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
40 lb. Maize Silage	12·0	0·40	0·12	4·27	2·08		
10 lb. Lucerne Chaff	9·2	1·55	0·07	2·77	0·84		
5 lb. Concentrate Mixture	4·3	0·44	0·16	2·69	0·07		
	25·5	2·39	0·35	9·73	2·99	15·5	1 ÷ 5·6

The amount of digestible crude protein is a little higher in this ration than is required by the standard.

The following extracts from the "Agricultural Gazette" of New South Wales, December, 1927, are given as an illustration of what complete feeding, when combined with high milk-producing power, can accomplish:—

"On 15th October, 1927, Wagga Gladys, the seven-year old Jersey cow of the Hawkesbury Agricultural College herd, completed 365 days' official test for a yield of 20,835 lb. milk, with an average test of 5·52 per cent. and 1,149,385 lb. butter fat, which is equivalent to 1,384·8 lb. commercial butter. This is an official world's record for both milk and butter fat production for the Jersey breed. It was achieved on twice-a-day milking, whereas all the great records in other countries have been made on three and four milkings a day. Wagga Gladys calved on 9th November, 1926, and on the day of her last periodical test she yielded 53·5 lb. milk and 3·694 lb. butter fat in twenty-four hours.''

The following is extracted from the ''Agricultural Gazette'' of New South Wales, October, 1927, and shows the ration fed to Wagga Gladys, together with the record of her 273 days' performance:—

''On her present lactations as a seven-year-old, which is still in progress, she has produced for the first nine-months period 15,951 lb. milk, of 5·3 per cent. test, 839,814 lb. butter fat, being equal to 1,011·8 lb. commercial butter. . . . On the hypothesis that feeding must be linked with breeding to secure high production, an indication of the ration fed to Wagga Gladys may be given.

''*Concentrates.*—The following mixture was fed daily at the rate of 1 lb. to every 3½ lb. milk produced:—300 lb. maize meal, 200 lb. bran, 100 lb. crushed oats, 50 lb. linseed meal. During March and April the mixture was altered by the substitution of 25 lb. cotton seed meal for 25 lb. of the linseed meal.

''*Bulk Ration.*—The daily bulk ration consisted of:—25 lb. maize silage, 10 lb. lucerne chaff (of poor quality during May), 3 lb. bran, and 1½ lb. linseed meal. During March and April half the linseed meal was replaced by an equal amount of cotton seed meal. During the latter half of the month of March the silage was replaced by an equal amount of green corn stalks chaffed.

''*Grazing.*—The pastures were very poor, except after the Easter rain. In December, Wagga Gladys was grazed on a poor stand of green lucerne for two days prior to test. In January, she was grazed on green lucerne for two hours daily for a week previous to test. In February, March, and April, she was grazed on green lucerne for two hours daily, and in May and June for one hour daily. In July, green oats were given for a week previous to the test; Gladys and the whole herd went off in butter fat yield this month, and the green oats were blamed. In August, she was grazed on green lucerne for two hours daily.''

It will be interesting to compare the abovementioned cow's milk production and her feeding with the standard used in computing the examples of rations previously given. The weight of Wagga Gladys is not known, and though it may not be 1,000 lb. live weight, this figure will be used for the sake of comparison.

The cow produced 15,951 lb. milk in 273 days—that is, 58·4 lb. of milk per day, of 5·3 per cent. fat. Using the minimum requirements of the standard, the cow should receive 4·32 lb. digestible crude protein and 29·7 total digestible nutrients.

The cow produced on an average 58·4 lb. of milk per day, and it is stated that for every 3½ lb. of milk produced 1 lb. of the mixed concentrate was given; therefore, 16·6 lb. mixed concentrate was fed daily. The following is the total ration fed:—

—	Dry Matter.	Digestible Nutrients.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
Bulk Ration—							
25 lb. Maize Ensilage ..	7·5	0·25	0·07	2·67	1·30		
10 lb. Lucerne Chaff ..	9·2	1·55	0·07	2·77	0·84		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1·5 lb. Linseed Meal ..	1·3	0·33	0·11	0·47	0·06		
16·6 lb. Mixed Concentrate	14·6	1·50	0·52	8·20	0·37		
	35·2	4·00	0·82	15·32	2·67	22·8	1 ÷ 4·9
Allowing 10 lb. Green Lucerne for one hour's grazing ..	2·4	0·32	0·04	0·63	0·29		
	37·6	4·32	0·86	15·95	2·96	24·0	1 ÷ 4·8
Or— Allowing 20 lb. Green Lucerne for two hours' grazing ..	4·8	0·64	0·08	1·26	0·58		
	40·0	4·64	0·90	16·58	3·25	25·4	1 ÷ 4·7

It will be seen that the digestible crude protein, 4·32 lb., agrees with that required by the standard, and that the amount of total digestible nutrients of this ration is somewhat lower.

WATER ELEVATOR.

This device, reprinted from "The Canegrowers' Weekly" (Mackay), should be of interest to farmers with a creek frontage:—

A length of No. 8 fencing wire is stretched from a post at the top of the bank to a stake driven into the creek bed, in such a position that the lower end of the wire will be completely under water. A bucket is suspended from the wire by means of a pulley and snap hoop. A weight must be attached to the side of the bucket in order to sink it. The bucket is operated by a rope, either with the hand or with a small windlass.

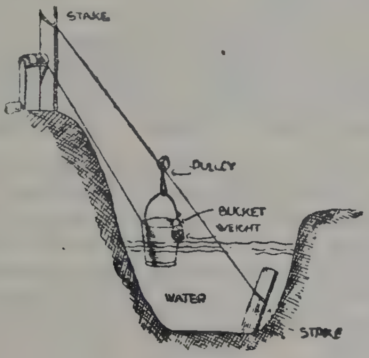


PLATE 10.

Ropiness in Cream.

By E. B. RICE, Dairy Research Laboratory.

DURING a recent visit to the Laidley Butter Factory for the purpose of carrying out certain scientific investigations, the attention of the writer was drawn to a can of ropy cream on the platform. It was pointed out that, in spite of all efforts on the part of the farmer concerned to combat the trouble, intermittent outbreaks of ropiness occurred.

An inspection of the farm supplying the cream was made, and samples from various sources which were suspected of harbouring the particular casual organism were collected. Upon arrival back at the factory preliminary work was commenced which was followed up upon return to the Dairy Research Laboratory. Finally a bacterium, which reproduced the ropy or slimy condition when inoculated into fresh and sterilized milk and cream, was isolated. The source of this organism on the farm was the water from a tank adjacent to the milking shed. Cultural and other laboratory tests demonstrated that the organism was *Bacterium viscosum,* a common cause of ropiness in dairy products in many countries.

It may be mentioned that a large and deep dam is situated on the property, and attention was focussed on this as being the most probable source of the trouble, it being thought that the udders and other parts of the bodies of the animals were contaminated while they were wading in the dam. However, attempts to isolate the bacterium from this water yielded negative results. This case goes to show very clearly how the origin of a defect which may mean considerable monetary loss to the farmer may lie in the least suspected quarter.

For the information of farmers who may at times be faced with the ropy milk problem, a brief description of the defect, the responsible organisms, the methods by which they may gain access to the milk, and means for their eradication are given below.

General.

Ropiness in milk or cream must first of all not be confused with gargety or mammitis milk. All practical farmers are aware that the latter condition is present immediately the milk is withdrawn from the udder of the affected animal. The condition observed in mammitis milk arises from the disintegration of the tissues of the udder as a result of bacterial infection. Ropiness, on the other hand, is never observed when the milk is first drawn, and usually about twelve hours elapse before the defect is apparent. When a fork is placed in ropy milk the viscous condition causes the milk to adhere to the fork when it is withdrawn, so that threads several inches and longer are obtained (see photograph).

To the city milk vendor an outbreak of ropiness may result in severe monetary loss, as the abnormal appearance renders the milk unsaleable. It often happens that the milk is quite normal when palced in the customer's jug, but after it has been held in the home for some hours ropiness develops. Naturally, the householder becomes suspicious and is inclined to associate the condition with disease. In reality, there is no evidence to show that ropy milk organisms are in any way detrimental to human health.

Peculiarly, in contrast with most microbial defects, ropiness is often encountered in dairies where all operations are conducted with scrupulous care. The milk, too, is often sweet to the taste on account of the normal souring being retarded.

Various Ropy Organisms.

The organisms mainly responsible for ropiness are—

1. *Bacterium viscosum.*—This bacterium which grows well at ordinary temperatures is usually overgrown by the rapid development of the common milk souring germ, *Streptococcus lactis.* Where low temperatures prevail, in the vicinity of 50°F., the growth of *S. lactis* is greatly retarded, but *B. viscosum,* which is able to grow faster at this temperature, is able to gain control of the fermentation. When cultivated in milk a gummy capsule surrounds the cell, which causes the viscid or ropy condition. *B. viscosum* was the organism responsible for the Laidley outbreak.

2. *Escherischia-Aerobacter Group.*—These organisms grow best at blood heat (98·6°F.). Their natural habitat is the intestinal canal of man and animals, on fodder and grains, and in the soil. Again ropiness is attributed to capsules formed by the cells.

3. An organism known as *Micrococcus freudenrichii* has been reported in Europe as being the cause of ropiness. It is frequently found in milk.

4. *Streptococcus lactis,* var. *Hollandicus.*—This organism is more particularly concerned with ropiness in cheese starters. The conditions result from the cells growing together in long chains.

Occurrence.

Under the usual conditions in the dairy the ropy bacteria are overgrown by the common milk souring bacterium, *S. lactis.* When conditions do obtain which allow them to gain control of the fermentation, it is only by persistent effort and attention to detail in all farm practices that they can be eliminated.

The experience of overseas observers points to ropiness being of more frequent occurrence in the winter months on account of *Bacterium viscosum,* perhaps the most common causal agent, being able to thrive at temperatures which are too low for other species to proliferate. From information gleaned during the course of many conversations with farmers at field days, which have been held recently under the Dairy Cattle Improvement Act, there is reason to believe that in this State the defect assumes more serious proportions in the warmer months of the year. This is also borne out by the number of samples which are arriving in the laboratory now that summer conditions have set in. The *Escherischia-Aerobacter* group, which grow better at higher temperatures, are frequently isolated from samples of ropy milk and cream, in which they occur in large numbers when responsible for the ropy condition.

The ropy milk organisms are common inhabitants of swamps, bogholes, or other places where stagnant water is lying. Through the animals wading into such places the udder, flanks, and other parts of the body become infested, and later in the milking process the bacteria are dislodged and fall into the milking pail. Water which is suspected of harbouring these organisms should never be used for washing-up purposes without previous boiling. Boiling will completely destroy the organisms. Once established in the dairy they are often able to be isolated from the dust on the floors of the bails and walls themselves. A thorough cleaning up of the stables is the first step in the campaign of elimination. Disinfection may be resorted to, either using a limewash or chlorine solution. Chlorine solutions in appropriate dilutions can be made up from the concentrated commercial preparations which are obtainable from stores in all dairying districts, and the directions on the package should be closely followed.

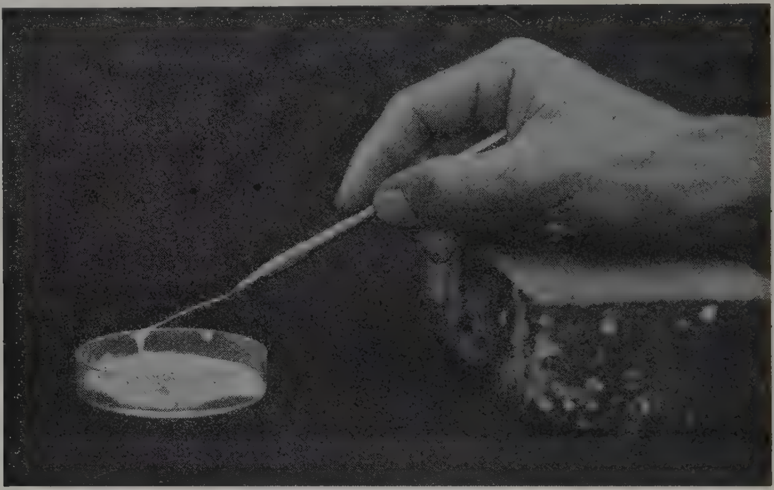


PLATE 11.
ROPY MILK.
Showing Ropiness produced by *B. viscosum* after inoculation into sterile milk.

Control of Ropiness.

Before remedial measures which will be of permanent benefit can be applied, it is first essential to ascertain the source of the organisms, otherwise only temporary relief is the most that can be expected from any steps taken towards control of the defect.

The factors which may be regarded as being of most significance in outbreaks of ropiness, in their order of importance, are—

(1) Improperly sterilized utensils.
(2) The use of impure washing-up water.
(3) Dust falling from the body of the animal into the pail during milking. The organisms adhering to the dust particles may come from the animals wading in contaminated water or from dust in the stables.

In the extermination of the infestation attention should be given to the following:—

(1) Keep the hands perfectly clean during milking.
(2) Scald and thoroughly dry all utensils.
(3) Before milking wipe the udders and flanks with a clean cloth which has been moistened with dilute Condy's fluid or chlorine solution.
(4) Boil all water used for washing-up purposes.
(5) Maintain bails and dairy buildings in as clean a condition as possible. Disinfection or limewashing may be advisable.

Butter—Over-Run Explained.

By G. B. GALLWEY, A.F.I.A., A.A.A., A.A.I.S., Inspector of Accounts, Dairy Produce Acts.

OVER-RUN is a subject that the supplier of cream to a butter factory should understand and know what it is and how it comes about.

It is peculiar to the dairying industry, for the dairy farmer is paid for more butter than is actually in the cream which he supplies. The reason for this is that during the process of churning the butter maker, in addition to consolidating the butter fat in the cream supplied by the farmer, adds moisture and salt to it, which correspondingly increases the weight of the resultant butter, as compared with the butter fat in the cream when received at the factory.

Over-run is defined as being the excess of the quantity of butter actually manufactured over the quantity of the commercial butter content of all cream, received at a butter factory, as estimated from the chart approved. In other words, it is the quantity of butter in excess of that estimated prior to actual manufacture. Therefore, in order to find the over-run it is necessary to ascertain the difference between the quantity of commercial butter as estimated by the chart and the quantity of commercial butter obtained from such cream. This is ascertained from a specially prepared chart which is so calculated as to show at a glance the quantity of commercial butter which should be made from any given weight of cream testing between 29 per cent. and 50 per cent. butter fat.

The basis on which the chart is moulded is to assume that the average moisture content of butter will be 14 per cent. plus the addition of salt. As both these constituents are bound to vary in the actual butter when made, it is obvious that the only method which will assure to the farmer a full return for the actual butter made from his cream is a system which provides that he shall have credited to him any additional commercial butter which the factory has produced, over and above that which has been credited to him in accordance with the quantity calculated by means of the chart.

The factors which affect the estimated quantity of butter manufactured are governed largely by the exactness or otherwise of the factory hands performing the duties of weighing, sampling, testing, and recording of the cream on its arrival at the factory. It can be set down definitely that when cream arrives at a factory it has a certain weight, and that it contains a certain percentage of butter fat. It is the duty of the factory staff to weigh and test this cream correctly and to record the result accurately.

Control of Over-run.

The correctness of all scales at a butter factory is an important factor in the controlling of over-run. It must be remembered that scales at a factory are subject to inspection by the Weights and Measures Department and the farmer's scales are not so checked. It is part of the routine duty in a factory, before commencing operations each day, to check and adjust the scales with a standard weight. Weights are important because they are the first items in estimating the manufacture and can raise or lower the over-run, as the case may be. The reason is that, if the weights are entered as higher than the actual quantity received, they increase the estimated manufacture and decrease the difference between it and the actual manufacture. On the other hand, if the weights are lowered the estimated butter is correspondingly less and the difference between it and that actually manufactured is increased.

The testing of the cream for its butterfat content is a factor equally important as that of weighing. Care should be taken to see that all glassware used in this connection has been approved by the Department of Agriculture and Stock. All glassware passed by the Agricultural Chemist is marked indelibly with the D⩚A stamp. In testing the cream care should be taken to see that the samples are taken correctly and treated prior to and during testing. The reading of the tests is important, for they operate in the same way as the weights. Reading the test above its correct percentage means that the estimated butter is increased and the over-run decreased; while reading the test below its correct percentage means that the estimated butter is decreased and the over-run increased.

Both these factors, weights and tests, can operate independently or together. For example, the weights may be raised or lowered and the test read correctly; or the test raised or lowered; or both weight and test may be recorded above or below the correct figure. Every change, whatever it is, will affect the over-run either one way or the other. Another aspect which has a considerable bearing on over-run is the generally accepted factory practice to weigh to the nearest pound and to read the test to the nearest percentage mark.

In ordinary circumstances, it is claimed that this give and take system works sufficiently accurately and equitably for factory practice. Still there are possibilities that a set of circumstances may operate under this system which may affect the over-run appreciably, but on the law of averages such occasions would be very rare. Therefore, provided that the system is carefully followed, the farmer need have no fear on this score, particularly as such a practice saves the factory from working in fractions, and as the farmer owns the factory, this system is indirectly a saving to the farmer. In any case, these factors do not affect the ultimate quantity of butter acually made, but merely influence the estimated quantity of butter obtainable, and this either raises or lowers the over-run, the value of which is eventually paid to the farmer.

Another aspect of platform operations which may affect over-run is the loss of cream, which occurs after weighing. In such circumstances, it should be obvious that the quantity of butter estimated will not be realised because of the fact that, since weighing, a portion of the butter-fat has been lost, and is therefore not available for churning. Careless handling in this regard may even bring about an under-run. Here, as in the case of fat loss in buttermilk, is emphasised the need for care in respect of these particular operations.

The Influence of Factory Processes.

The next step in considering over-run is the actual manufacture and the factors involved are the process of churning, the composition of the butter and the loss of butter.

The first of these is principally of a technical nature and occurs through loss of butter-fat in the butter milk, which is influenced by the size of the grain and churning temperature. Other reasons can be given for this loss, and these include:—

1. Some types of machinery used are liable to increase the normal loss of butter-fat; and
2. The temperature of the cream, the capacity of the churn, and the condition of the equipment.

These can be overcome only by practical work and experience, and the buttermaker learns the best temperature at which to churn and the quantity of cream to place in the churn to control this loss. However, it must be remembered that even these factors vary in different districts.

The composition of the butter is an important factor in the manufacture of the product and the over-run. There is a maximum and minimum range of moisture within which the buttermaker must work, and this is the legal standard of 16 per cent. and the chart standard of 14 per cent.

No butter can be exported or sold within Australia which contains more than 16 per cent. of moisture, and the buttermaker must, therefore, not exceed this quantity. With the fine control which can now be exercised by the buttermaker over the manufacturing process, the legal standard of 16 per cent. can be exceeded appreciably and the over-run correspondingly increased. However, such an action on the part of a factory is unfair to the consumer, besides being a breach of the law. Salt has only a minor influence and assists to make the over-run.

How Butter Loss Occurs.

Loss of butter occurs through the machines used in cutting butter into pats and packing into boxes. There must always be some loss on the patting machines, but where care is exercised this is not a very important factor. The greatest loss takes place in packing bulk butter at the factory.

The Commonwealth Government requires every box of butter exported to contain 56 lb. 2 oz., and such butter is always taken into the manufacture figures of a factory at 56 lb.; therefore, all butter packed in excess of 56 lb. 2 oz. is a direct loss and reduces the over-run, an important phase of factory management.

In packing bulk butter for local sale a factory is only required to pack 56 lb., and any butter over that weight is therefore a direct loss and reduces the over-run. Moreover, payment is only made for 56 lb. of butter and the purchaser gets something for nothing, although in reality, if he gives full weight to his customer, he cannot hope to get 56 pats of 1 lb. from 56 lb. supplied to him in bulk.

An examination of the factors involved leads to the consideration of what the over-run paid by a factory should be. As pointed out previously, the method employed in registering weights and tests may be expected to cause slight variations. Salt also is infinitesimal, and these three items might be set down as yielding approximately 1 per cent.; while moisture, if kept within the legal margin, should at most add another 2 per cent., giving in all a maximum of 3 per cent., which might be regarded as the standard over-run of an efficiently run factory.

No supplier can expect to get the full value of the weight and test of the cream and a high percentage of over-run, nor can the factory pay him a high percentage. if the operations are carried out on a practical and equitable basis.

It should then be obvious that if all the operations at the factory are faithfully carried out, the over-run should be kept at a fairly uniform figure.

High over-run is evidence of either lax methods at the factory, or that the factory has manufactured a butter which does not comply with the legal standards set down by the Dairy Produce Acts.

Summary.

To summarise the position over-run depends on the following factors:—

Efficient and correct weighing and testing of cream;
No avoidable loss of cream;
Correct churning methods;
Composition of the butter being within the legal standards; and
No undue loss of butter through careless handling or weighing.

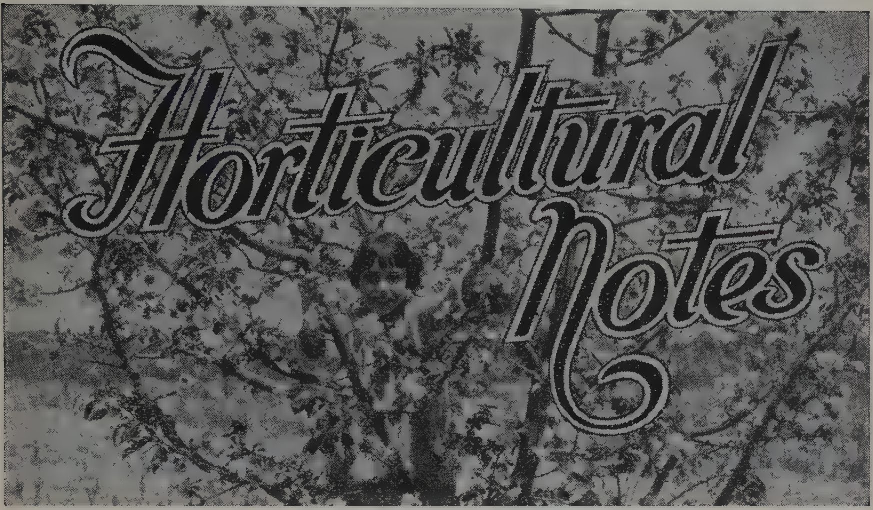
DAIRY INDUSTRY POSSIBILITIES.

Thus an editorial in the Brisbane "Telegraph":

"It is the plain duty of Queenslanders engaged in primary production to make the very best of their opportunities, not only for their own personal benefit but also in justification of the national assistance which in one way and another is extended to so many branches of production. This generality applies with special force to the dairying industry, which owes so much to the people of Australia in consenting to stabilised prices, and which in this State, and, we fear, in large part of the rest of Australia, is conducted with a minimum of regard for scientific aids and methods. Recent remarks in these columns on the subject of the relative neglect of herd-testing in Queensland have received valuable endorsement from the Minister for Agriculture, Mr. Bulcock, and with his reputation for thoroughness one is encouraged to hope that he will pass on from words to definite action towards the further stirring of the dairy farmers to a better appreciation of their responsibilities.

"Official returns have made it obvious that the generality of herds are of anything but a satisfactory character, with the consequence that the average butter-fat yield is far below the legitimate expectation as based on actual results where systematic herd-testing for the culling of poor-quality beasts is practised. Unfortunately, the testing in this State is confined to a few herds, and those probably among the best, for it is the most enterprising farmers who are anxious to submit their herds to the test, but even the records so obtained disclose a substantial yield below the modest average set up by the Department of Agriculture as easily attainable. As a matter of cold figures it should be possible to get a return of 50 more lb. of butter-fat per beast than is now recorded in Queensland, and that figure multiplied by the approximate number of dairy cows in milk—730,000—would give the dairy farmers an improvement worth more than one and three-quarter million pounds sterling per annum, assuming butter-fat to be worth 1s. a lb.

"At present the farmers are deliberately throwing away that material advantage by retaining beasts which are uneconomic. Many of them are not worth their keep, and others could be brought into better productiveness by attention to pasturages which periodical testing of the cows would show to be necessary and expedient. The prodigality of Nature in this favoured State has been partly to blame for the indifference shown towards measures of betterment which other countries and States have more wisely adopted. The neglect of those measures here is a folly reflecting not alone on the farmers but upon the whole community which is bolstering an industry that could be, and ought to be, worked more profitably and efficiently. Consistent campaigning by the Department of Agriculture should have an appreciable effect in awakening a largely increased number of dairy farmers to the clear duty which rests upon them to maintain a higher standard of production."



THE ENDLESS WIRE SYSTEM FOR BANANA PLANTATIONS.

The use of the endless wire system for transporting bunches of bananas from the plantation to the packing shed means a saving of much time and hard work for the banana-grower. The use of the system need not necessarily be confined to banana plantations; any hillside orchardist will find it a great convenience.

Briefly, the idea of the system is to despatch the fruit from a central point in the plantation on carriers which run on carrier wires to the packing shed. The carriers are attached to an endless wire running round grooved wheels at each end of the system. The carriers are placed in such a way that as one is sent to the packing shed with its bunches the second carrier is returned uphill for its load.

The system is not difficult to instal. One of the chief things is to see that the structure is strongly built. A steep grade does not necessarily make the system impracticable, as the provision of a braking system serves to check the speed of the carriers.

First a central part of the plantation must be selected as a despatching point. This should be conveniently situated so that bunches from surrounding parts of the plantation can be easily carried to it. From this site select a position at the bottom of the plantation for a receiving station. A suitable place is usually found on the top of a small rise, as this will give the wires greater height so that the bunches will not brush against the plants whilst they are in transit. This receiving terminal should also be suitable for the building of a packing shed in order to save unnecessary handling of the fruit, and it should therefore have easy access to a roadway. Difficulty may be experienced on some slopes in obtaining sufficient height for the wires. In such cases, a staging can be built at the despatching point and the terminal for the wires made higher up the hill, somewhat as shown (Plate 12).

Construction of the System.

Reference to Plate 13 will explain the building of the system. The main posts marked "A" at both top and bottom terminals must be solid and about 12 feet long. They require to be firmly fixed in the ground, at least 4 feet deep and preferably 5 feet, and should be well braced. In Plate 13 the posts at the despatching end are shown anchored to a convenient stump for additional strength. The distance between the posts at each terminal may be about 6 or 8 feet.

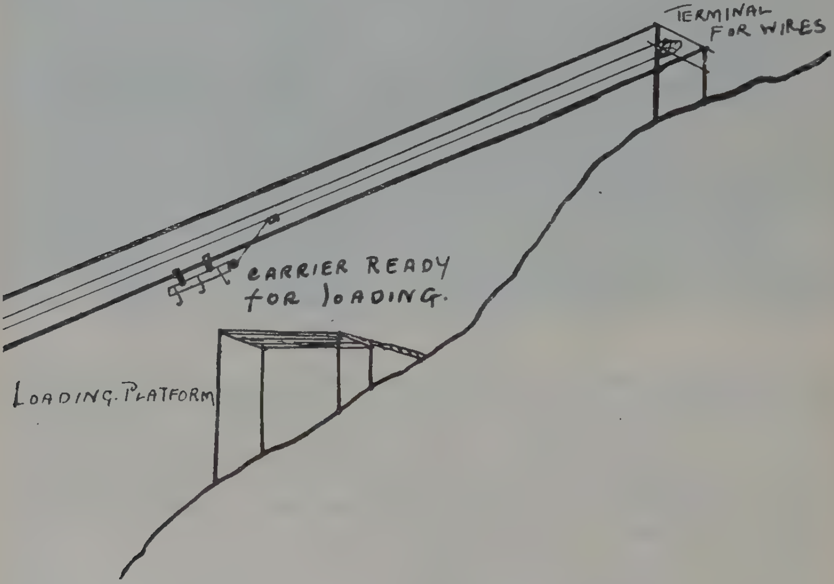


PLATE 12.

About 6 inches from the top bore inch diameter holes through each of the posts for the carrier wires ("B"). The holes in the posts at the top end should be inclined downhill and those through the bottom posts inclined uphill so that the wires when strained will not kink at the entrance to the holes. A straight pull also makes it easier to strain the wires, which should be drawn as tightly as possible. To do this, tie the wires firmly round the posts at the sending end, and at the receiving terminal wind the slack of the wires round good strong rollers ("C"). If wooden rollers are used, they should be made of tough cross-grained timber, 4 inches in diameter, clear of sap. Straight-grained timber is liable to split and is not capable of carrying the load. Iron levers $\frac{3}{4}$ inch to 1 inch diameter ("D") passed through holes bored at right angles to one another in the ends of the rollers will give a good purchase and enable the wires to be tightly strained. For the carrier wires, heavy 10 by 12 gauge oval steel wire is sold specially for the purpose. This wire has a breaking strain of 2,140 lb. and is suitable for all ordinary distances up to approximately 600 yards. Some systems in use are a mile long, but heavier wires are required for these.

For the endless wire ("K") 12 by 14 gauge steel wire is generally used. This runs round grooved wheels fixed at each terminal.

Posts marked "E" are sunk and well braced at the receiving terminal. If a good anchorage such as a stump is not available at the

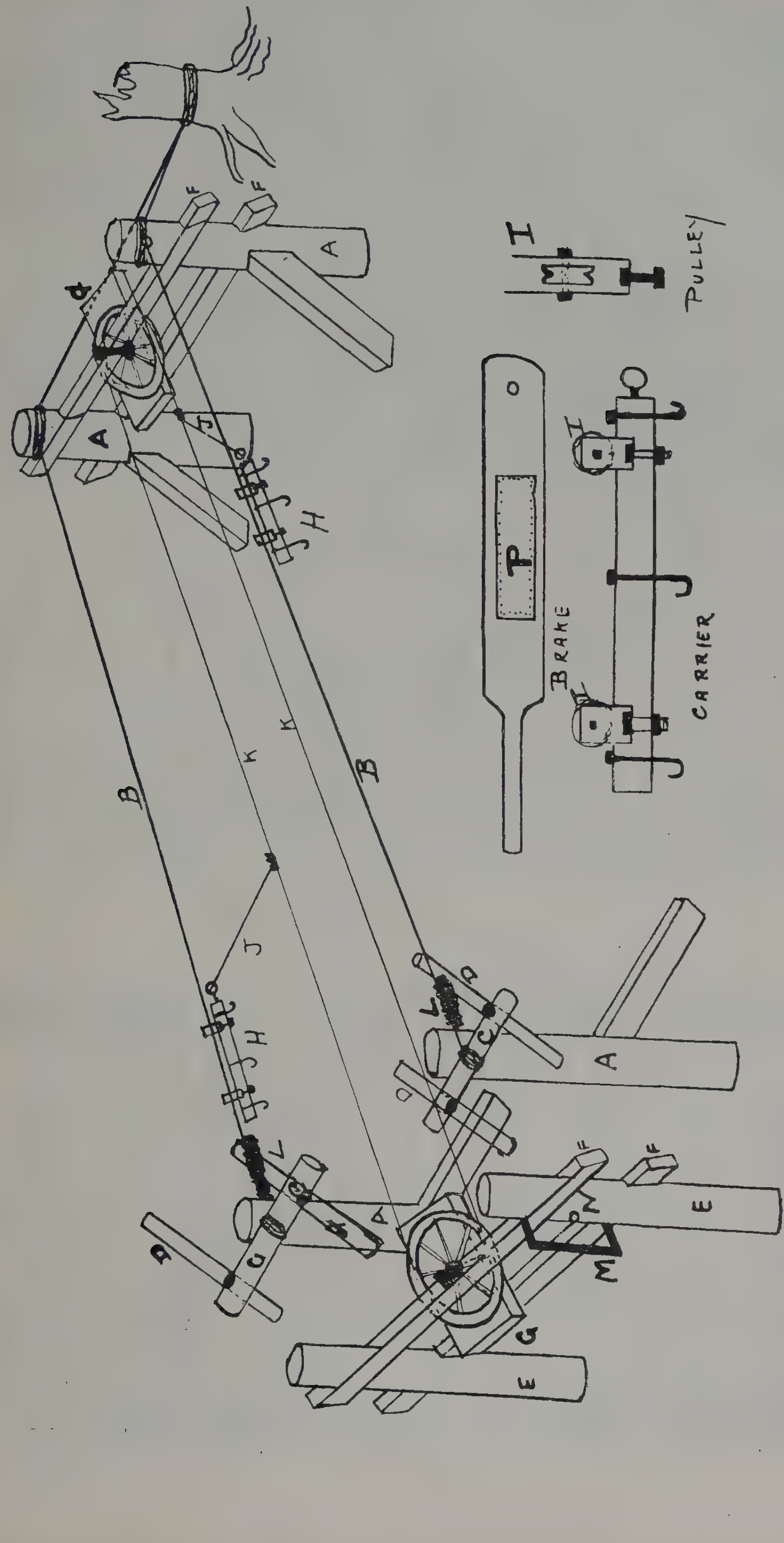

A
A
A
B
B
K
K
J
J
H
H
L
L
C
C
D
D
d
E
E
F
F
F
F
G
G
M
P
BRAKE
CARRIER
I
I
PULLEY

Plate 13.
Plan of an Endless Wiring System for Bananas.

despatching end, similar posts should be erected there also. Cross bearers ("F") made of 4 by 3 inch hardwood to carry the wheels are then bolted across the posts. Care is necessary in fixing the bearers, as in order to prevent the wire running off the wheels they must be tilted slightly, the wheel at the top being inclined downhill and that at the bottom uphill. In Plate 13 it will be noted that at the sending terminal the top bearer is placed across the front of the posts and the posts are checked out to allow the bottom edge of the bearer to be completely housed in the posts. The lower bearer is placed across the back of the posts, and in this case the posts are checked out so that the top edge of the bearer is completely housed. A piece of solid hardwood is next bolted to the top of the bottom bearer to form a small platform ("G"), so that when a hole for the axle of the wheel is bored through the top bearer the auger will continue on and bore a corresponding hole in the platform for the other end of the axle. The wheel, when fitted, will then be inclined towards the wheel at the bottom terminal, where a similar procedure is followed to tilt the wheel uphill. Old motor cycle or motor car wheels serve the purpose very well and may be obtained at any car wreckers for a few shillings each.

The endless wire, when fitted, should be fairly tight, otherwise it will tend to run off the wheels. The approximate length required should be measured and run round one of the wheels whilst the latter is in position, and tied with a piece of tie wire to prevent it slipping off. The other wheel should then be lifted out of its platform and brought forward several feet. The wire should then be placed around it, and the two ends tied. The tie should be strongly made. The wheel is next drawn back to its correct position on the platform, and the axle inserted to hold it in its place. The use of a Spanish windlass made with a rope and two or three pulley blocks is an easy way of drawing the wheel back into place. If facilities for making a Spanish windlass are not available, the wheel with the endless wire tied on may be strained through a post fixed behind the terminal posts ("E") in the same manner as the carrier wires are strained. If the wire is still not tight enough, the join will have to be broken, the wire shortened, and the work done again.

Construction of Carriers.

The frames of the carriers ("H") are constructed from pieces of hardwood measuring about 4 feet long by 3 by 1 inches. Holes are bored for the hooks, as shown, from which to hang the bunches. The pulleys ("I") can be made by a good blacksmith. The pulley frame is usually 1½ by ¼ inches iron bent as shown. Through the bottom a ⅜-inch hole is bored for a bolt to fasten the pulley to the carrier. A second ⅜-inch hole is bored through the two sides for a steel bolt to serve as an axle for the pulley wheel, which can be an ordinary grooved wheel of about 2 inches diameter. The pulley wheels should be kept frequently and liberally oiled. A small hole bored through the pulley wheel above the axle bolt will be found of considerable benefit. The pulley frame is partially housed in the wooden frame of the carrier, as shown, by mortising out a piece of the wood and then bolting right through. At the end of the carrier a hook to which to tie the tail rope ("J") is screwed in. The carrier is fitted on the wire ("B") by removing the axles for the pulley wheels, fitting the wire in the pulley frames, and then replacing the wheels. The tail ropes should be long enough to allow for a sag in the carrier wires when carrying a load, and they should be firmly fastened with the wire to the endless wire to prevent it slipping. Also, if one tail rope is tied to the join in the endless wire, the latter will not be required to run round the wheels, and the tie will therefore not cause any obstruction. It is also a good idea to fit a swivel in the tail rope, near where it is tied to the endless wire, to prevent the tail rope from twisting round it. At the bottom terminal of each of the carrier wires, a piece of wood ("L") about 2 feet long wired on will act as a stop to hold the carrier when it arrives with its bunches, and prevent it from bumping the posts and bruising the fruit.

The Brake.

The brake is made from a piece of solid hardwood fashioned with a handle like an elongated cricket bat. It should be loosely fastened with a long bolt to one of the bottom posts at the point "N." For extra strength a piece of iron ("M") may be bolted through the post to form a D, through which the brake is inserted. The brake should be only loosely bolted, as it must be capable of being moved forwards and backwards, according as it is pressed against the wheel to check its speed or released to allow the wheel to spin faster. A piece of leather ("P") tacked to the face of the brake where it comes into contact with the wheel will increase its efficiency and reduce friction.

SOME TROPICAL FRUITS.

5. THE JACK FRUIT.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

KNOWN botanically as *Artocarpus integrifolia* or *A. integra,* the Jack fruit is a close relative of the Bread fruit, the subject of last month's article. Whilst the Bread fruit is strictly tropical in its requirements, however, the Jack fruit is much less exacting and will grow under conditions which would be fatal to the Bread fruit.

The tree is a large and handsome one reaching a height of 50 to 70 feet. Foliage is dense, the leaves being deep green, leathery and glossy. Its fruit are probably the largest known, and individual specimens have been reported to weigh up to 1 cwt. This is probably somewhat of an exaggeration however; a closer estimate would be 40 to 50 lb. Even at this weight the fruit is a large one.

The tree is a native of the mountainous districts of India and the Malayan archipelago, but it is now widely distributed throughout the tropical regions of the globe. It is fairly plentiful in North Queensland, chiefly in old gardens, and is often to be found as one of the few surviving trees in abandoned gardens over-run with lantana. Even under such trying conditions the trees are usually healthy and fruitful.

The Jack fruit is usually raised from seed which, when planted fresh from the fruit, germinate readily. The trees make rapid growth, a height of about 20 feet being reached within five or six years. The first crop of fruit is produced at about five years old. At this age the fruit is produced on fairly long thick stalks growing from spurs on the main branches. As the trees become older the fruit are produced directly from the main branches and later from the trunk. On very old trees the fruit is reported to form on the roots, its presence being discovered by the cracking of the soil above it. This cropping habit has not yet been observed in Queensland, possible because our trees have not reached sufficient age. Fruit borne on the roots is reported to be of finer flavour than that borne on the branches.

The fruit is oblong to oval in shape, sometimes up to 2 feet in length, although 12 to 18 inches is the usual size. The skin is covered with short, hard-pointed studs. In colour it is pale green in young fruit, changing to yellow and finally to brownish yellow as it ripens. The flesh is divided into numerous small segments, each consisting of a seed surrounded with pulp which possesses a strong pungent odour. Those accustomed to it regard the pulp as possessing a very fine flavour, but the strong smell deters most people, and many who overcome the odour find the flavour too spicy. Besides being used fresh the fruit is preserved and dried. The seed may be used as well as the flesh. These are either boiled, or roasted like chestnuts. The season of ripening of the fruit extends over several months during the summer and autumn.

Although no propagation work has been done, several distinct races are known and recognised. The most clearly defined are a firm fruited race and a soft skinned one. In Asiatic countries the former of these is the most favourably regarded. In Queensland, trees of three types of foliage have come under the notice of the writer, one with long narrow leaves, another with broad oval leaves of a darker green, and a third with lobed leaves. Fruit of the first two named have been observed, but up to the present not those of the third. The first has a larger fruit more fleshy and juicy than the second, which possesses more seeds and drier flesh.

For best results the Jack fruit should be grown on rich deep soil, and should receive abundant moisture. Good drainage is necessary, however. Very little cultural attention is needed once the trees are well established. They withstand fairly cool weather without injury, but should be grown in situations free from frost. Trees grown in cool climates, however, are said to produce fruit of inferior quality.

THE FRUIT INDUSTRY IN THE NORTH.

The Director of Fruit Culture (Mr. H. Barnes) has made available a summary of the report of the Instructor in Fruit Packing (Mr. J. H. Gregory) on a recent visit to North Queensland Fruitgrowing Districts.

THE districts visited were—Ambrose, Yarwun, Targinni (tomatoes and papaws); Rockhampton Centres, Yeppoon, Tanby, Byfield, Bondoola (citrus, pineapples, tomatoes, and papaws); Gracemere (pineapples); Nankin (citrus); Bowen (mangoes, pineapples, and tomatoes); Townsville and Magnetic Island (pineapples, mangoes, papaws, and citrus).

All these district were suffering severely from the prolonged dry spell, the conditions becoming worse the farther north one went.

The first district visited was the Yarwun-Ambrose-Targinni area, where a demonstration of packing was held at Machine Creek, Ambrose, on the property of Mr. Anderson. Local growers who attended showed much interest. Advantage was also taken by the Head Teacher of the local school of an invitation extended to him to bring along the whole school of about forty pupils. Unfortunately, the dry weather made it difficult to obtain sufficient fruit for a large demonstration. Papaw growers were visited and the inadvisability of marketing green papaws and tomatoes stressed.

At Rockhampton the C.O.D. section was visited and inspections made, Mr. S. McCullough, Manager of the Section, being very helpful. An examination of the retail fruit shops showed that the best fruits displayed were oranges and apples. Tomatoes on the C.O.D. section and in the shops suffered from immaturity, quite large percentages of waste from this cause being apparent.

PLATE 14.

Pineapple plantation, Horseshoe Bay, Magnetic Island, North Queensland.

At Bowen growers were, owing to the lack of rain, in a difficult position. The tomato crop was nearing completion for this year. The first consignment of mangoes was harvested on the day of my arrival. The mangoes were shedding heavily, and there is every prospect of only a light crop being marketed.

The country around Townsville is perhaps the driest I have ever seen. In the company of Mr. Todd, local Fruit Inspector, I visited the fruit agents and gave a demonstration of packing at the Townsville Fruit Exchange. The pack of the fruit from the north beyond Townsville was poor, and agents stated that it was more satisfactory to handle Southern fruit than that from North Queensland. Packing instruction appears to be very necessary for growers north of Townsville.

The fruit shops, which mostly appear to be owned by Chinese, were displaying fruit of somewhat better quality than those in Bowen, Rockhampton, or Yeppoon, though there appeared to me to be a tendency to overcharge for the tropical fruits, mangoes, common variety, being 1½d. each, better class 2½d. each, small papaws 9d., granadillas 1s. 3d. for small fruit.

Fruitgrowing on Magnetic Island is confined to two areas, Horseshoe Bay and Nellie Bay (Mandalay). Pineapples, mangoes, papaws, and small quantities of citrus are the fruits at present grown. The output of pines from the Horseshoe Bay area is approximately 15,000 cases, 10,000 cases of which are marketed on distant markets. The largest shipment sent last season consisting of 1,500 cases. The shipping service is confined to one boat a week, departing on Tuesdays at 3.45 p.m., making it necessary for all fruit to be loaded within three hours. Loading is done by the growers from the small jetty with the assistance of a small trolley on rails which runs a length of about 600 feet over the sandhills on the foreshore. I am informed that a road across the sandhills to the jetty is contemplated. This road should be of assistance.

PLATE 15.

A mango plantation, Nellie Bay, Magnetic Island, North Queensland.

Both rough and smooth leaf pines are grown. Considerable difficulty is experienced in keeping the smooth leaf pines small enough for the popular sizes on the market. The present practice is to grow roughs and to replant with smooths in an effort to keep the fruit small. Interest is being evinced in the use of artificial fertilizers. Demonstrations of various packs were given, although the fullest advantage could not be taken when demonstrating owing to a shortage of fruit, the harvesting season being somewhat late, due possibly to the long period of dry weather experienced this spring. The rainfall this season is said to be the lightest in the experience of most of the growers.

Investigation showed that it was quite often the practice to harvest and pack the fruit in the field without attempting any method of cooling before packing. Often the fruit for the South was packed without padding material being used to protect it. The necessity for cooling and using satisfactory packing materials was stressed. After packing the fruit is carted and stacked on the jetty or at the head of the jetty tramway, being exposed to the summer heat for, in some cases, as long as two days, fruit being placed there on Sunday for loading on Tuesday. From this it can be seen that there is a great risk of damage to the

PLATE 16.
Granadillas, Nellie Bay, Magnetic Island, North Queensland.

fruit. Two days of excessive summer heat would be as detrimental to it as six days of transit in the boat. Further, the heating of the fruit before it is stowed causes a retention of heat in the hold. It is strongly recommended that a shed be placed at the jetty. Unless this is done all the benefits of the best packing possible will be minimised, as the heating of the fruit will cause excessive shrinkage and ripening in transit to distant markets. There is still plenty of room for an extension of the industry at Horseshoe Bay. The soil, which is of a loose granite nature, is easily worked.

PLATE 17.
Pineapples, Horseshoe Bay, Magnetic Island, North Queensland.

Papaws are apparently a profitable crop. The quality of the fruit this season was to some extent affected by the prevailing dry weather, some fruit showing a type of granulation in the flesh and a lack of juice. Notwithstanding this, the flavour of the fruit was excellent. Retail prices were 9d. for fruit running twenty to the case.

The crop of mangoes was suffering greatly from dry weather and the fruit was dropping everywhere. No large fruit was seen. Growers were interested in the prospects of distant Southern markets and many keen inquiries were made about market prospects and packing.

Some excellent specimens of granadillas were seen on different parts of the island. There should be no reason why with careful packing this type of fruit should not be sent to Brisbane markets where a ready sale awaits it.

In summing up, one cannot but be impressed by the eagerness of the growers visited to increase their knowledge. The request was repeatedly made for a further visit in May, June, or July next season to enable citrus and winter crops of pineapples to be dealt with.

Fruit and Vegetable Country Distribution Scheme.

Among the people met with during my visit to northern districts was a resident who came from a district nearly 200 miles from Townsville. This resident had procured fruit under the Fruit and Vegetable Distribution Scheme initiated by the Minister for Agriculture. In answer to questions as to the benefits and shortcomings he expressed the following opinion:—

The scheme was of great assistance. Vegetables were all good, citrus fruit from Palmwoods was of quite fair quality, deciduous fruits and grapes direct from Stanthorpe and pineapples from Magnetic Island were excellent.

◆

EXPIRED SUBSCRIPTIONS.

A very large number of subscriptions to the Journal expired in December, and have not been renewed. A further large number expires with this issue.

Subscribers whose term has expired have been continued on our mailing list, and a yellow wrapper on this month's Journal (January) is an indication that their subscriptions are now due.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

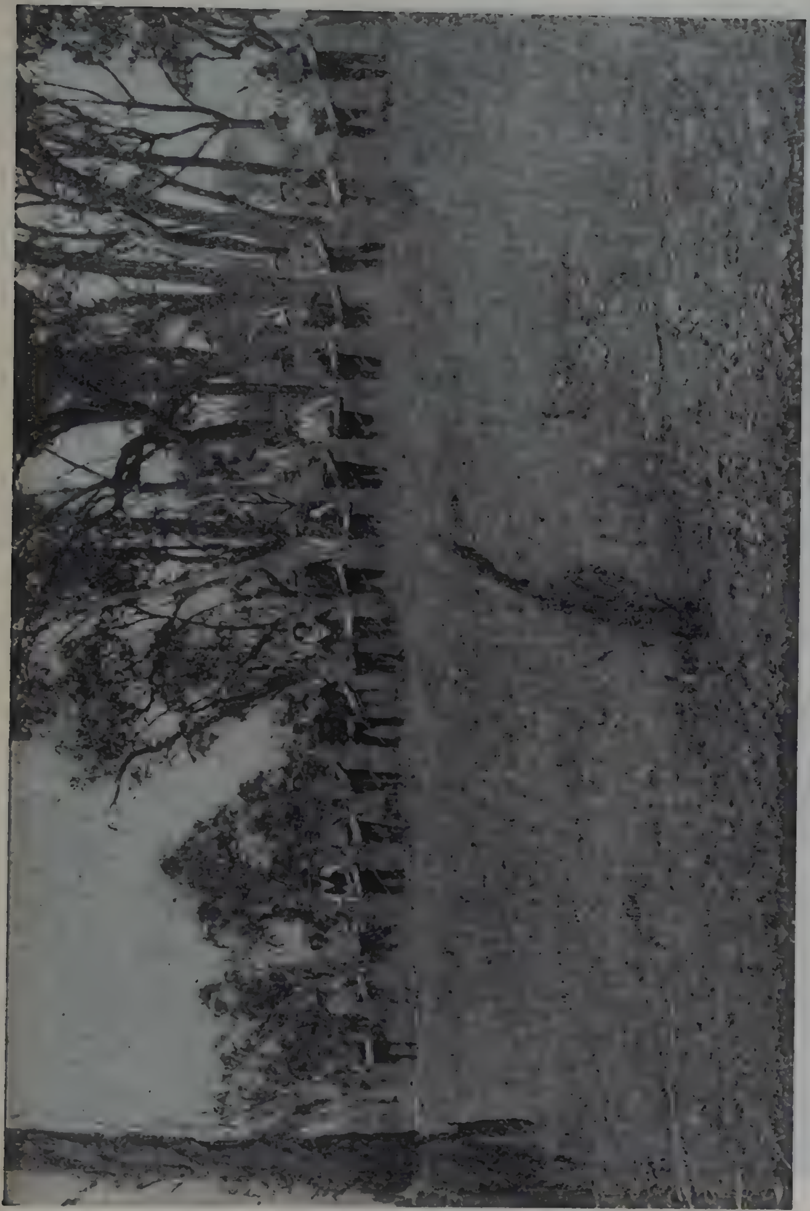


PLATE 18.

CAMPAIGN AGAINST PEAR PEST.

Employees of the Prickly-pear Commission are equipped with Atomizers for the Poisoning of Tiger Pear.

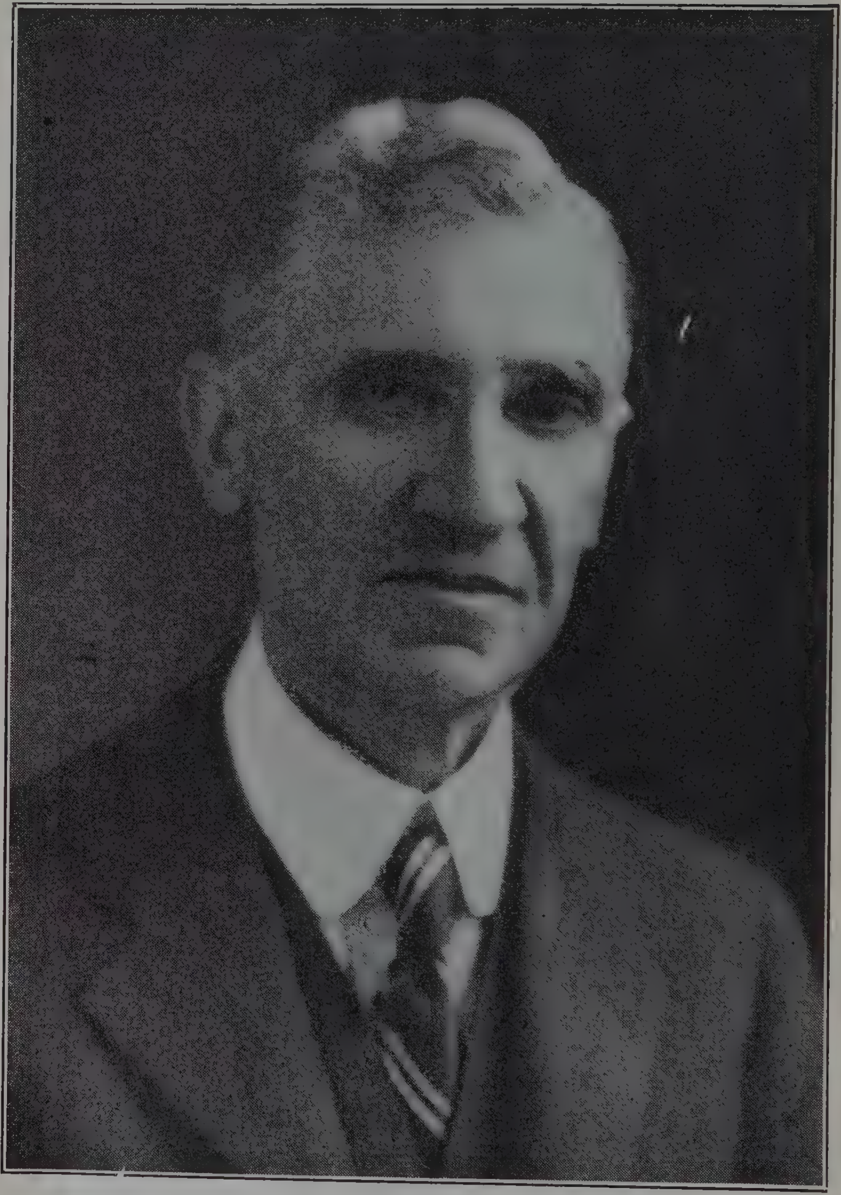


PLATE 19.
Mr. J. D. STORY, I.S.O., Public Service Commissioner.

[*Block by courtesy of "The State Service."*

PUBLIC SERVICE COMMISSIONER.

PREMIER'S TRIBUTE.

Subjoined is an interesting excerpt from ''Hansard'' containing a fine tribute to the Public Service Commissioner, Mr. J. D. Story, I.S.O., by the Premier, Hon. W. Forgan Smith, LL.D.:—

''The Leader of the Opposition and the member who has just resumed his seat did well to speak as they have done concerning the Public Service Commissioner. There is no doubt at all that Mr. Story and his staff are very valuable servants to the Government, and, through the Government, to the people. Mr. Story is a man of extraordinary mental power. In addition, he is able to concentrate on a vast amount of work. Like the Leader of the Opposition, I have often suggested to Mr. Story that he should not work so intensely. No one could be more assiduous in his duties than he is, and his efforts on behalf of the State have been very valuable indeed. When he was Under Secretary for Public Instruction he did a very great deal to build up the educational system in Queensland, and many generations of people in this State have enjoyed the advantage of the system which he was responsible for instituting. Mr. Story is much more than a Public Service Commissioner. If he confined himself to the duties of a Public Service Commissioner alone he would have a much easier time than he has, but he does special work for the Government in making investigations and reports that have been invaluable in many ways. In addition to that, he looks after the Government's interests on the Senate of the University, his association with which has been of tremendous benefit to that institution. . . . . Mr. Story's services are valuable, and we cannot afford to lose him, and I appreciate the fact that honourable members generally on both sides of the Committee realise the value of having a public servant like him. The term 'public servant,' used in its fullest sense, is the term that properly describes this officer.''

Agricultural Notes

THE relief rains received from 4th to 7th December throughout the southern agricultural areas were of considerable benefit to dairymen, many of whom had been obliged to revert to hand feeding. The scattered storms subsequently received in the coastal areas south of Mackay and on the Downs have assisted to revive pastures and summer growing crops. The rains were generally too late to be of assistance to early sown maize, the greater portion of which was therefore utilised for fodder purposes. The year 1935 will be recorded as one of the hardest experienced by both farmer and grazier, as the rainfall has been considerably under average throughout the State.

Wheat.

Harvesting was generally completed under favourable conditions, resulting in a high quality product, only a small proportion being classified as feed. Deliveries have exceeded expectations, being in the vicinity of 3,000,000 bushels, amply demonstrating the remarkable recuperative powers of the wheat plant and its ability to utilise the limited supplies of available soil moisture. Some excellent individual yields have been recorded by many progressive growers, who have lost no time in gathering the crop and commencing ploughing operations in preparation for the 1936 sowing. It is reported that Mr. F. W. von Pein harvested 6,300 bags (averaging 12½ bags per acre) in five days utilising five tractor drawn header-harvesters. This is typical of the methods in vogue in the Pittsworth and Dalby districts where extensive individual areas are the rule. The season recently experienced clearly indicates the great advantages gained by the early ploughing and preparation of the soil resulting in increased moisture conservation, as a result of which farmers are frequently able to make successful seasonal sowings, despite the absence of adequate May and June rains. The flour tax is to be continued until 30th June next, and in the absence of any change in marketing conditions, the first advance payment to growers has already been posted.

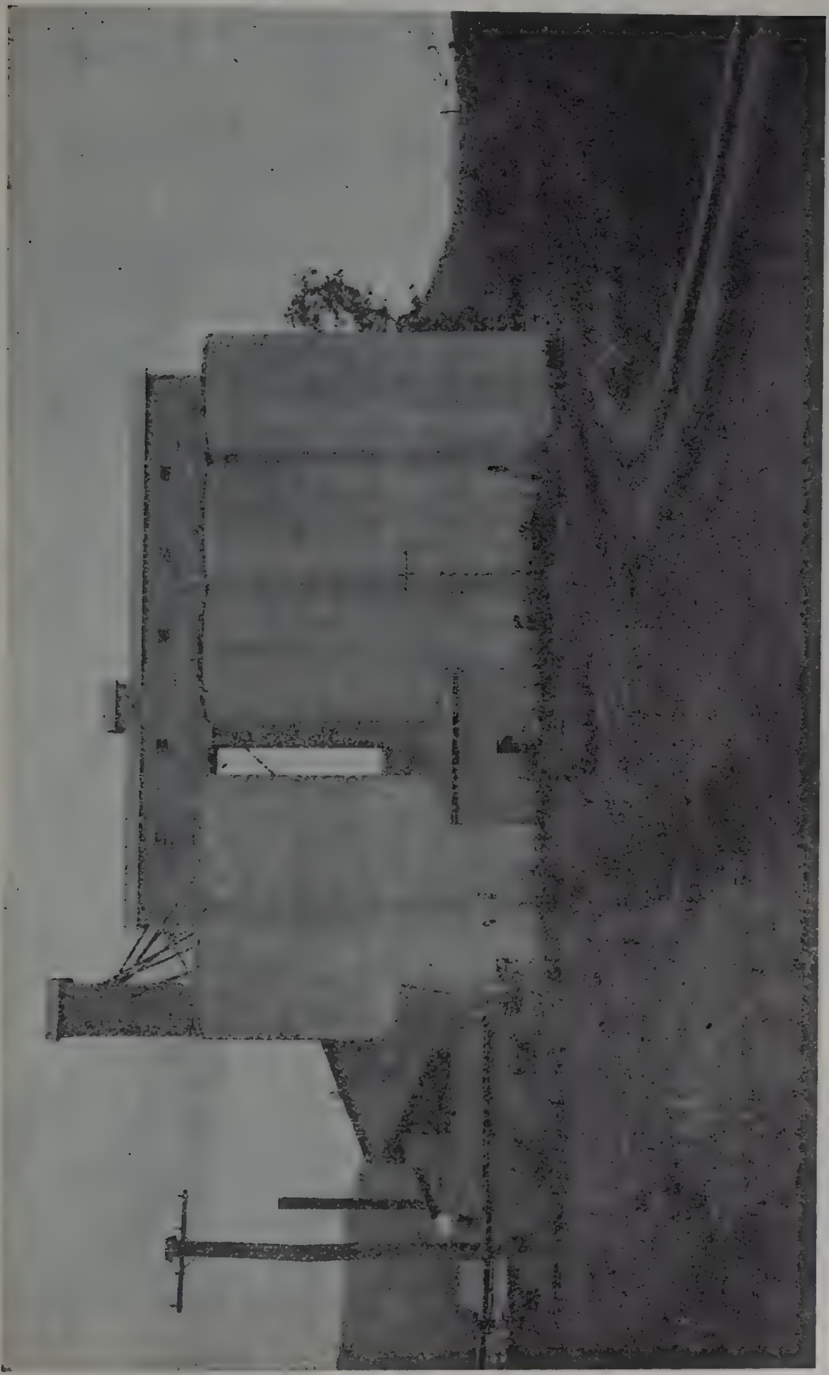


Plate 20.
Maize Silos, Atherton.

Tobacco.

The final auction sale of the year was held by Dalgety and Co. on the 28th November, and although with the exception of a few choice lines the lots submitted comprised late season's leaf, good clearance was effected.

In reviewing the marketing of the 1934-35 crop too much stress cannot be laid upon the fact that there is still a large percentage of growers who are evidently not aware that they are losing money by not paying strict attention to this section of the industry. Inspections during the past series of sales have disclosed many faults in grading, amongst which the following were the most noticeable:—

Varying length of the leaf in the hands, too many leaves in the hands, different quality leaf used for wrapping the butts, careless tying and tying too deep down the hands. Correctly graded leaf is often found to be baled irregularly resulting in a mixed package thereby prejudicing the sale of the better quality leaf offered. Incorrect packing of bales is another fault to be avoided. The butts of the hands should be packed towards the top and the bottom of the bale in neat even layers and not across the package. Bales are handled on end and when packed crosswise the leaf is liable to suffer damage in transit with subsequent loss in value.

The current season's operations are now in full swing and in the Texas-Inglewood district planting out is completed. The success achieved in Mackay-Sarina district last season by later planting has so influenced growers that very little planting out will take place before February.

The Bowen and Townsville districts are still suffering from lack of rainfall. Conditions in those areas are so bad that, unless good falls of rain are experienced at an early date, with the exception of a few irrigated areas, no tobacco will be planted. It is worth recording that from the 1st July until the middle of December, Townsville has received only fifteen points of rain. Mareeba and Dimbulah have fared slightly better, but rain is now urgently required.

Mould has caused severe damage to seed-beds at Mareeba, while it is apparent on the lower leaves of crops at Texas. However, other areas have experienced little trouble from this scourge.

Sugar.

Conditions favourable for crop growth have been experienced in the areas from Tully North, but all cane districts from Ingham to Mackay are urgently in need of heavy rains. The Southern areas were favoured with beneficial rains early in the month. These arrived in time to revive the crop which had been seriously checked in growth. The mills have, with the exception of Tully and Mourilyan, completed their harvest, with generally satisfactory results. The present forecast shows that approximately 608,000 tons of sugar will be produced in Queensland for the 1935 season.

Cotton.

During the early part of the month dry conditions prevailed throughout the cotton belt, until the 4th, when between that date and the 9th, and again on the 15th and 16th, very useful precipitations were recorded over most of the cotton areas, with the exception of the Callide. In this district rainfalls of less than an inch were generally recorded. This will only give temporary relief, more being required, especially for new scrub burnt areas.

This should result in a good development of growth, together with a setting of squares, and in the early planted cotton the development of bolls, and will allow of some late planting of cotton being effected.

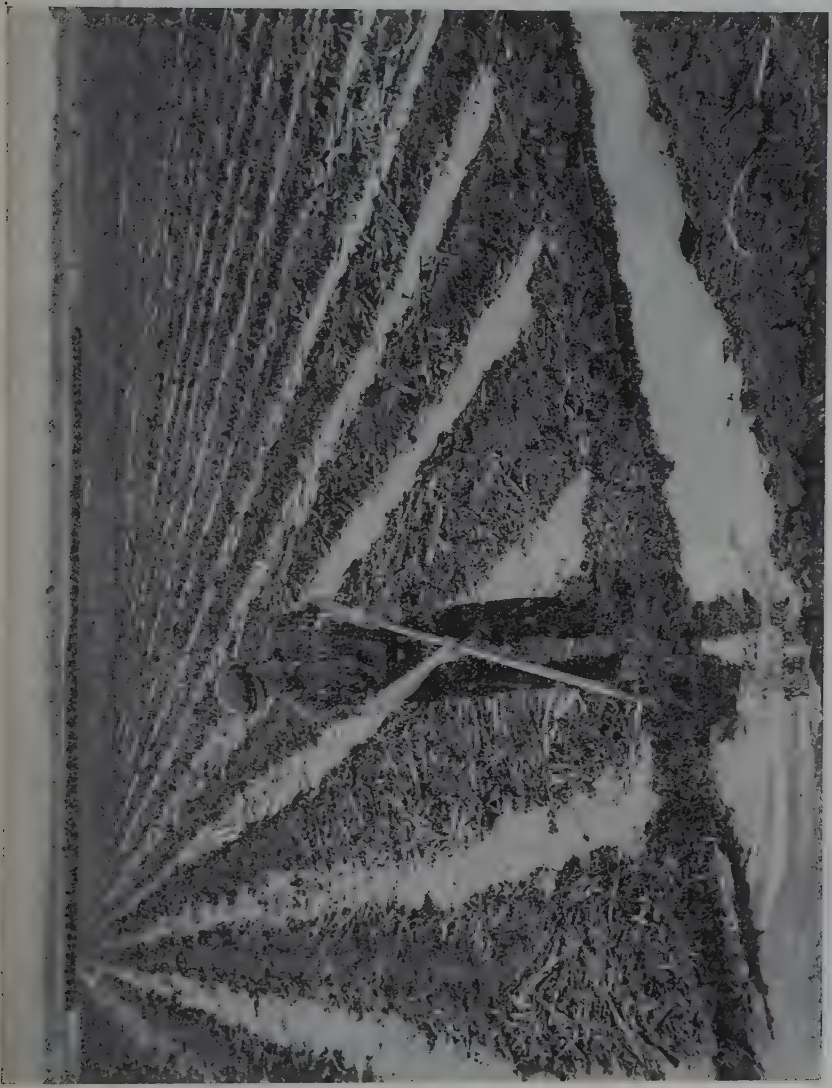


PLATE 21.

An irrigated cane field, Burdekin Delta, North Queensland.

[*Photo. by courtesy of "The Telegraph," Brisbane.*

Owing to the generally dry conditions prevailing after germination an excellent deep rooting system has been established, which should enable the plants to withstand, to a much greater extent, any future hot dry spells which may occur.

Insect pests, other than those attacking cotton in the seedling stage, have not been severe. One of the boll worms has been responsible in some fields for a certain amount of terminal loss.

General.

Early sown sudan grass and sorghum crops have responded to the December rains and will provide good feed, illustrating their ability to withstand a prolonged dry spell. With the exception of some favoured southern coastal areas, the early potato crop was generally a failure. However, the main planting in January and February is usually more productive, owing to the more reliable nature of the autumn rains. At the time of writing extremely dry conditions still prevail in the Townsville district where serious stock losses have occurred, and the residents are faced with a shortage of water supplies. Naturally only those farmers having irrigation facilities are able to carry on with the seasonal establishment of tobacco and other crops.

During the year 1934-35 Great Britain absorbed 56.26 per cent. of Australia's total exports. Apart from the United Kingdom, Australia's best customer was Japan, followed by Belgium, France, New Zealand, United States of America, China, and Germany. British countries supplied 59.90 per cent. of Australia's imports during a similar period. The United States of America, Japan, and the Netherlands East Indies, respectively secured the bulk of the remaining trade.

PLATE 22.
A view on the Russell River showing the Graham Range.

PLATE 23.
Cascades, near Cairns, North Queensland.

AGRICULTURAL RESEARCH.

APPOINTMENT OF PROFESSOR GODDARD.

Professor E. J. Goddard, Dean of the Faculty of Agriculture within the University of Queensland, and Professor of Biology, has joined the Department of Agriculture and Stock for twelve months to take charge of a scheme for the reorganisation, extension, and co-ordination of research activities relating to agricultural and veterinary science. The Senate of the University has made Professor Goddard available for the work and the Government has approved his appointment as from the beginning of January. Professor Goddard will retain his association with the University, and this connection will offer special advantages in facilitating co-ordination of researches and in the directing of students in their training for special branches of agricultural science.

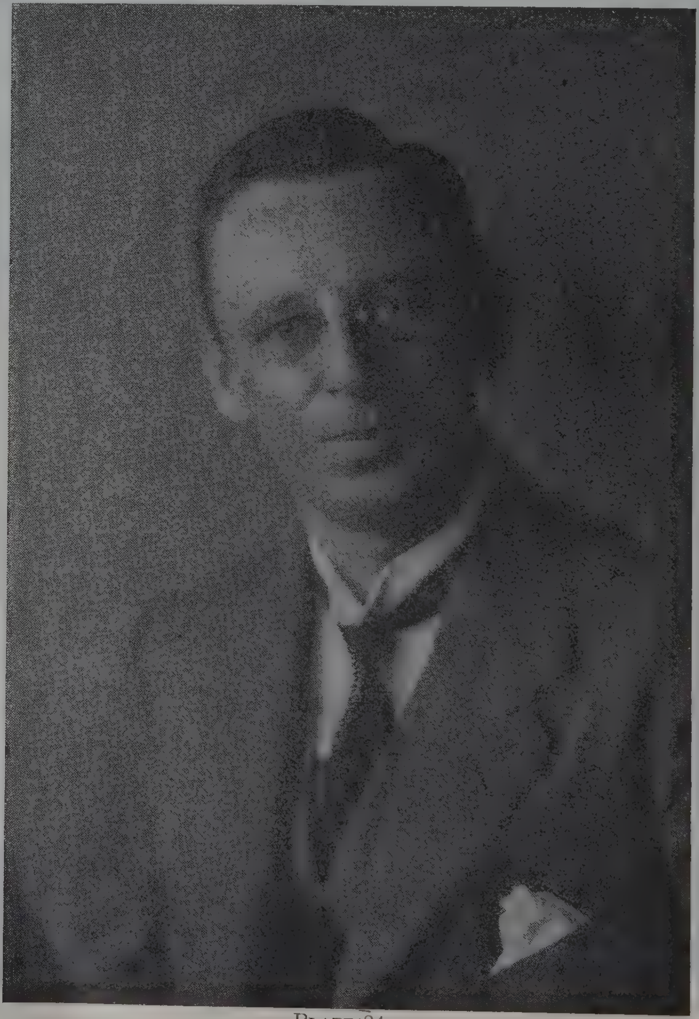


PLATE 24.

Professor E. J. GODDARD, D.Sc., Dean of the Faculty of Agriculture within the University of Queensland.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) in announcing the appointment of Professor Goddard stated that although the initial term was twelve months, extensions might be made from time to time. Two years ago a conference of Ministers of Agriculture had agreed that research should be undertaken into the nature of the problems confronting each State, instead of each State continuing to work on various important and unimportant problems. The idea was that there should be co-ordination between the agricultural research services of Australia. One of Professor Goddard's primary duties would be to investigate the incidence of researches and try to eliminate overlapping. Few eminent technicians were available in agriculture and, therefore, their services must be used to the best advantage. The need for co-ordination is realised when attention is drawn to the various factors that may operate in an agricultural problem. We must utilise in that connection all the available man power represented in the Department and other institutions such as the University. The position is made more evident still when we view the possibilities of co-operation with the activities of the Commonwealth Council of Scientific and Industrial Research and the other Australian States.

Agricultural research was so far advanced to-day that definite planning was necessary. Professor Goddard, with the heads of the scientific branches and the Minister himself, would try to map out a comprehensive programme extending over a number of years. The agricultural possibilities of North Queensland would call for special consideration. The Bureau of Tropical Agriculture was being established at South Johnstone, and it would be possible to lay down a considered programme so that new avenues of agriculture might be economically exploited.

Experimental work was of major importance, and by the co-ordination of the department's activities, sustained research would be possible. Professor Goddard's advent to the department would afford much closer union between the educational and official sides. He hoped the professor would find time to interest himself in the careers of the younger men. Not the least important of his duties would be to determine the amount of training the department might be prepared to make available for various junior officers.

As part of the scheme a new research branch has been created in the Department of Agriculture. The Minister, in announcing this fact recently, said the branch must become one of the most important under his control. Three outstanding officers had been appointed, and additional appointments would be made from time to time. Mr. R. E. Soutter, wheat breeder, had become agricultural research officer in wheat and maize; Mr. L. F. Mandelson, who had recently been studying abroad, had been appointed research pathologist; and Mr. Atherton, entomologist stationed at Atherton, had also been seconded for special work. The branch would deal with the practical application of research work, and every facility would be provided for it.

Professor Goddard is a graduate of the University of Sydney where he obtained the degrees of Bachelor of Arts and Doctor of Science. After graduating he served on the staff of the Department of Biology, Sydney University, for a number of years, and in 1907 was appointed Macleay Research Fellow of the Linnean Society of New South Wales. He vacated the fellowship in 1910 on his appointment to a Professorship at the University of Stellenbosch, South Africa. He relinquished that post at the end of 1922 on his appointment to the Professorship of Biology at the University of Queensland. He has been associated with numerous and varied biological researches during the past thirty years, and has given special attention to agricultural problems since coming to Queensland. He has been closely associated with the creation of the Faculties of Agriculture and of Veterinary Science at the University of Queensland. As a member of the Commonwealth Council for Scientific and Industrial Research he is in close touch with the research activities of that organisation.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of Australian Illawarra Shorthorn Society, Jersey Cattle Society, Friesian Cattle Society, production charts for which were compiled during the month of October, 1935 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Hillvale Linda	J. H. Weber, Peak Crossing	9,986·95	367·173	Charms Pride of Oakvale
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Stamford Lady	Mr. L. Coonan, Indooroopilly	9,176·05	363·325	Stamford Brilliant
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Sunnyside Honey 8th	P. Moore, Wooroolin	10,929·15	413·483	Bruce of Avonel
College Granny 3rd	Queensland Agricultural High School and College, Gatton	8,939·21	378·295	Fussy's Kitchener of Hillview
FRIESIAN.				
UNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Ryfield Argus Echo	F. C. Noller, Kumbia	9,382·35	322·939	St. Athans Argus
JERSEY.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Ellerdale Mabel 3rd	J. and R. Williams, Crawford	7,199·25	442·224	Golden Noble of Ellerdale
Langside Quip	G. W. Young, Ivnerlaw	5,832·7	398·193	Masterpiece Yeribee of Brucevale
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Langside Prim	G. W. Young, Inverlaw	6,066·85	313·793	Masterpiece Yeribee of Brucevale
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Langside Dainty	G. W. Young, Inverlaw	5,863·25	306·353	Masterpiece Yeribee of Brucevale
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Glenview Mavoureen	G. Harley, Childers	5,233·5	287·01	Glenview Goldfinder
College Rosaleen	Queensland Agricultural High School and College, Gatton	4,777·08	283·272	Burnside Defender
College Peggy 2nd	Queensland Agricultural High School and College, Gatton	4,054·03	247·88	College Chieftain
Glenview Pretty Maid	W. S. Kirby, Byrnestown	4,217·66	236·964	Glenview Goldfinder
Balmoral Golden Belle	H. B. Roberts, Maleny	3,785·2	231·335	Carlyle Sovereign

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Stations 4QG Brisbane and 4RK Rockhampton by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 7th January, 1936, a ten-minutes' talk, commencing at 7.5 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for January, February, and March, 1936:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 7th January, 1936.—''The Fertilizers Act of 1935,'' by Mr. R. A. Taylor, Inspector and Examiner, Fertilizers Branch.

Thursday, 9th January, 1936.—''The Dairy Produce Acts Amendment Act of 1935,'' by Mr. G. B. Gallwey, Inspector of Accounts, Dairy Branch.

Tuesday, 14th January, 1936.—''The Wheat and Wheat Products Act of 1935,'' by Mr. L. Cain, Marketing Branch.

Thursday, 16th January, 1936.—''The Farmers' Assistance (Debts Adjustment) Act of 1935,'' by Mr. A. Gray, Agricultural Bank.

Tuesday, 21st January, 1936.—''Farm Training for Boys,'' by Mr. J. A. Kerr.

Thursday, 23rd January, 1936.—''The Value of Silage,'' by Mr. H. W. Ball, Assistant Experimentalist.

Tuesday, 28th January, 1936.—''Summertime Troubles with Cream,'' by Mr. O. St. J. Kent, Dairy Research Laboratory.

Thursday, 30th January, 1936.—''The Value of Late Cultivation of the Cotton Crop,'' by Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 4th February, 1936.—''Microbes in the Dairy,'' by Mr. E. B. Rice, Dairy Research Laboratory.

Thursday, 6th February, 1936.—''Some Factors in the Control of Worm Parasites,'' by Dr. F. H. S. Roberts, M.Sc., Entomologist.

Tuesday, 11th February, 1936.—''Fodder Trees,'' by Mr. C. T. White, Government Botanist.

Thursday, 13th February, 1936.—''Forwarding Cotton to the Ginnery,'' by Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 18th February, 1936.—''The Stock Foods Acts Amendment Act of 1935,'' by Mr. F. B. Coleman, Officer in Charge, Stock Foods Investigation Branch.

Thursday, 20th February, 1936.—''The Primary Producers' Organisation and Marketing Acts Amendment Act of 1935,'' by Mr. L. Cain, Marketing Branch.

Tuesday, 25th February, 1936.—''The Agricultural Bank and Rural Assistance Board,'' by Mr. A. Gray, Agricultural Bank.

Thursday, 27th February, 1936.—''Types of Barns and Methods of Curing Employed in South Africa,'' by Mr. R. A. Tarrant, Instructor in Agriculture.

Tuesday, 3rd March, 1936.—''The Tobacco Disease Situation in Queensland and in America,'' by Mr. L. F. Mandelson, B.Sc.Agr., Assistant Plant Pathologist.

Thursday, 5th March, 1936.—''The High Cost of Doing Nothing,'' by Mr. J. F. F. Reid, Editor of Publications.

Tuesday, 10th March, 1936.—''The Life History of the Honey Bee,'' by Mr. Henry Hacker, F.R.E.S., Entomologist.

Thursday, 12th March, 1936.—''The Pineapple Industry,'' by Mr. H. Barnes, Director of Fruit Culture.

Tuesday, 17th March, 1936.—''Observations on Western Pastures,'' by Mr. S. L. Everist, Assistant to Botanist.

Thursday, 19th March, 1936.—''The Composition of Milk and Cream,'' by Mr. L. A. Burgess, Dairy Research Laboratory.

Tuesday, 24th March, 1936.—''Agriculture in Other Countries,'' by Mr. J. F. F. Reid, Editor of Publications.

Thursday, 26th March, 1936.—''Spraying Deciduous Fruits for Disease Control,'' by Mr. R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 31st March, 1936.—''Keeping Pigs Healthy,'' by Mr. L. A. Downey, Instructor in Pig Raising.

MR. HOOPER'S IMPENDING RETIREMENT.

TRIBUTES IN PARLIAMENT.

In the course of the discussion on the Departmental Estimates in the State Parliament, members on both sides of the Chamber referred to the impending retirement of Mr. S. S. Hooper, Accountant of the Department of Agriculture and Stock, and paid high tributes to his zeal and capacity as a senior officer of the public service. Notable among the speakers was Mr. W. J. Copley, M.L.A., formerly an officer of Mr. Hooper's branch, and following is the ''Hansard'' report of his remarks:—

''I take this opportunity to pay a tribute to a man who this year will retire under the public service regulations. He will be a great loss to the public service. I refer to the accountant of the department, Mr. Hooper.

PLATE 25.
Mr. S. S. HOOPER, Accountant of the Department of Agriculture and Stock.

Mr. Hooper, who was transferred from the Commonwealth service, was first appointed to the department forty-three or forty-four years ago. For more than forty years he has each year attended the sittings of Parliament and assisted the Minister to pilot his Estimates through Committee. This is a record that is not surpassed by any other accountant in the State, and is one that will bear comparison with a similar officer in any other State. Both the present Minister and an ex-Minister, the honourable member for Cooroora, told me they regarded Mr. Hooper—the Premier and the Public Service Commissioner also support their opinions—as a most valuable officer. I desire to pay a tribute to him for his services to the State. The account section began with Mr. Hooper himself, but the staff has increased to twelve to fifteen officers under Mr. Hooper's control. He has trained some very valuable officers for the public service, and some of his former subordinates now occupy important positions in our civic life. The Minister informs me—and I believe this is also a record—that for about ten years—with one exception—it has never been necessary for the department to incur unforeseen expenditure. That is a compliment to the officer who framed the Estimates of the department. I also understand from the Minister that Mr. Hooper has never failed him in his public duties. . . . . Mr. Hooper will leave the public service this year with the full knowledge that he enjoys the confidence of all those with whom he has come in contact. He enjoys the confidence of the Minister and his fellow-officers. He has a very fine record, and he leaves an excellent organisation for his successor.''

TRIBUTE BY THE MINISTER.

Replying to the general discussion on the work of his department, the Minister, Hon. Frank Bulcock, referred to Mr. Hooper's approaching retirement in the following terms:—

''I should not like to resume my seat without paying a personal tribute to the accountant of my department, Mr. Hooper. He has prepared the departmental Estimates for forty-one years, and, unfortunately, these Estimates will be his last. Mr. Hooper commenced work as a clerical assistant in the public service in 1886, and became accountant of the Department of Agriculture in 1894. He has framed Estimates for the last forty-one years, and his method has been used as a pattern by the various other Government departments. He has been more than an officer to the fifteen Ministers under whom he has worked. Mr. Hooper is that rare type of individual, who is not only the Minister's accountant, but also his guide and friend. He has very largely contributed, by his skilful financial administration, to the success of the department. He is respected by everybody with whom he comes in contact, and during the war period he acted as chief clerk in the absence of the present Assistant Under Secretary (Mr. R. Wilson), who was then chief clerk. Every officer in the department is grieved by the thought that Mr. Hooper is leaving. I am particularly sorry, because there is not a more honest, zealous, or conscientious friend in the department than Mr. Hooper has been to me and my predecessors. I hope that he enjoys a period of good health after he leaves the department, but there are personal circumstances that cause him to desire to be relieved of the work he is doing. I desire to pay a tribute on the floor of this Chamber to an officer who has done yeoman service for his State, and I feel that when he leaves the department will be the poorer for his absence.''

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Rough or Wild Poppy.

S.G.W. (Mulgeldie)—

Your specimen represents the rough poppy or wild poppy (*Papaver hybridum*). We have no particular notes about the toxic property of this particular poppy, but most poppies have similar properties. The ordinary field poppy of Europe contains two alkaloids, morphine and rheadine. The plants are poisonous, both in the green state and when dried and made into hay. Feeding tests in Europe indicate that "the symptoms are excitement, shown by continual movement, by pawing of the soil or litter. The complaint is not usually fatal, but when death does occur respiration becomes slower, and after a few convulsive movements death occurs owing to asphyxia." Another authority gives stupidity, retention of urine, colic, with sickness and diarrhœa, convulsions, and epileptic symptoms, so probably your neighbour's claims that it made the cow temporarily insane are correct.

Mat Grass

A.C. (Woodford)—

The specimen is the broad-leaf form of mat grass or carpet grass (*Axonopus compressus*). As you know, much trouble has been caused by the spread of this grass in coastal Queensland. If it invades the paspalum pastures, particularly those which are heavily stocked, it very much lessens their carrying capacity. For second-class country, however, we think the grass has some definite use. Of the two forms, broad-leaf and narrow-leaf, we think the broad-leaf is somewhat the better.

"Everlasting" Emu Grass. A Variety of Darling Pea.

H.L.E.S. (Harlin)—

The specimens forward with your letter of the 6th instant have been determined as follows:—

The plant with the yellow flowers is *Helichrysum apiculatum*, the small "everlasting." This plant is very common in many of the pastures of Queensland. It is not known to possess any poisonous or harmful properties, but we have heard that the furry seed-heads cause impaction.

The plant of trailing habit with spikes of blue flowers and the leaves arranged in 5-7, radiating out from the top somewhat like the foot of a bird, is *Psoralea tenax*, emu grass, a common plant in many parts of Queensland, and generally regarded as excellent fodder. We have, at times, seen it eaten by stock, and on other occasions have received some from pastoralists with the report that it was being eaten by stock when it was both young and dry, and that, being drought-resistant, it was providing wonderful nourishment during a lean time. We regard the plant as especially valuable, and it is not known to possess any poisonous or harmful properties.

The plant with spikes of rather showy flowers and leaves composed of numerous small leaflets arranged on a slender rachis is *Swainsona galegifolia*, a variety of the Darling pea. The effects of the Darling pea are well known. It affects the nerve endings and sends animals stupid. It has been shown by feeding tests that the poisonous principle of the Darling pea is a cumulative one, and that it takes from six to eight weeks for the symptoms to appear. Most of the trouble has been with sheep, but it is very rarely eaten in quantity, particularly the variety you send, which is a fairly common one in forest country in Queensland a few miles inland from the coast.

We do not think any of these plants would cause any trouble, and if you have had losses we think the trouble must be looked for elsewhere.

Cluster Clover. Burr Trefoil.

J.E.A. (Biggenden)—

Your specimen represents the cluster clover (*Trifolium glomeratum*). We think this is one of the best of the annual clovers to grow under Queensland conditions. It seems to have been much on the increase in recent years, although it is found generally in a few isolated patches in cultivation paddocks and here and there in the pastures, but only where the ground has been disturbed. Stock are very fond of it, and seed is obtainable through ordinary commercial channels. It should be sown preferably in the early winter, when it provides a good deal of fodder during spring, dying off at the approach of hot weather about the middle of November.

The other plant you describe is probably the burr trefoil (*Medicago denticulata*), one of the best of our annual trefoils grown in Queensland. Even when the plant is dead the burrs are edible and quite nourishing. A drawback is that the burrs cause some trouble in the belly wool of sheep, but we think its good qualities outweigh the bad.

Stagger Weed.

M.A. (Calvert)—

The specimen represents the Stagger Weed (*Stachys arvensis*). It is commonly called ''mint weed,'' but is not to be confused with the ''wild mint'' that attracted some attention some time ago on the Darling Downs. It only affects stock when they are worked or excited in some way; ordinary resting stock seem to eat the plant with impunity. If you are making chaff of the lucerne crop, it would be as well to retain it for feeding to dairy cattle and resting stock, and not to working horses.

Bat's Wing Coral Tree.

''Sap'' (Townsville)—

It is rather difficult to determine specimens from the leaves only, but the one you send is very distinctive, and we feel sure it represents the Bat's Wing Coral Tree (*Erythrina vespertilio*). This is fairly common in Queensland, and it is commonly called cork wood, a name given to many other trees besides this. It grows to a medium-sized tree, and has very pretty red or salmon-red flowers. It is well worth growing as an ornamental tree.

Fossils from the West.

INQUIRER (Quilpie)—

The Director of the Queensland Museum, Mr. H. A. Longman, writes:—I have to acknowledge the receipt of your valued donation as undernoted and to express to you our appreciation of your kindly interest, and our sincere thanks.

Fragment of lower jaw of a large extinct marsupial; *Nototherium* sp. This fragment, which is from the right-hand side, contains remains of very worn molar teeth. It represents an aged individual. This marsupial was about as large as a bullock. In general shape it resembled a wombat, but its teeth are more like those of a kangaroo. A fragment of a rib, probably from the same animal, is also present.

Another fragment is a phalangeal bone from the foot of a giant extinct kangaroo.

We have only one previous record of these large marsupials from your district, although such remains are not uncommon in Condamine deposits on the Darling Downs.

WHAT THE YELLOW WRAPPER MEANS.

If your Journal is enclosed in a yellow wrapper, it is an indication that your subscription has expired.

Kindly renew your subscription without delay. Write your full name plainly, preferably in block letters. PLEASE USE THE ORDER FORM, which will be found on the last page of each issue.

Address your subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

General Notes.

Staff Changes and Appointments.

Mr. L. F. Andersen, Senior Herd Tester, and Mr. L. W. B. Verney, Inspector under the Dairy Produce Acts, have been appointed Dairy Instructors, Department of Agriculture and Stock. Mr. Verney will be attached to Gladstone.

The Officer in Charge of Police, Mingela, has been appointed also an Acting Inspector of Stock.

The Officers in Charge of Police at Wallumbilla, Yeulba, Jackson, and Miles, have been appointed also Inspectors under the Brands Acts.

Mr. R. H. Heaslop, Chatsworth road, Greenslopes, and Mr. A. H. Clayton, Point Lookout, Stradbroke Island, have been appointed Honorary Rangers under the Animals and Birds Acts.

The Officer in Charge of Police, Southport, has been appointed also an Acting Inspector of Stock.

Constable J. B. Chambers, Calen, has been appointed also an Inspector under the Slaughtering Act.

Mr. H. T. Green, Manager of "Thornhill," the property of Messrs. Thos. Borthwick and Sons (Australasia), Ltd., near Lowmead, has been appointed an Honorary Ranger under the Animals and Birds Acts in connection with this property, which was recently declared a sanctuary.

Mr. G. W. Turner, Stafford street, East Brisbane (a qualified candidate for appointment), has been appointed Inspector under the Dairy Produce Acts, the Diseases in Stock Acts, and the Slaughtering Acts, Department of Agriculture and Stock.

Mr. C. H. P. Defries, Inspector under the Dairy Produce Acts, the Slaughtering Act, and the Diseases in Stock Acts, has been appointed Acting Instructor in Agriculture, Department of Agriculture and Stock.

The headquarters of Mr. D. A. Logan, District Inspector of Stock, will be changed from Mareeba to Atherton.

Mr. J. Wyvill, Stock, Slaughtering, and Dairy Inspector, will be transferred from Nanango to Kingaroy, and Mr. T. Douglas, Stock, Slaughtering, and Dairy Inspector, from Kingaroy to Rockhampton.

Messrs. C. J. McKeon, Director of Tropical Agriculture, L. G. Miles, Plant Breeder, W. J. Cartmill, Analyst, and C. E. Whitehead, Cadet, Department of Agriculture and Stock, will be attached to the Bureau of Tropical Agriculture, South Johnstone.

Mr. A. McDowall, a qualified candidate from the examination for appointment to inspectorial positions, has been appointed Inspector under the Stock, Slaughtering, and Dairy Produce Acts, Department of Agriculture and Stock.

Mr. H. M. Northcott, Caretaker of the Stuart River Dip, via Tingoora, has been appointed an Honorary Inspector under the Diseases in Stock Acts, vice J. Northcott, deceased.

Dr. R. P. Rundle, of Proston, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

The following appointments have been made in the Department of Agriculture and Stock:—

Mr. A. F. Bell, M.Sc., Sugar-cane Pathologist, to be Assistant Director, Bureau of Sugar Experiment Stations;

Mr. C. R. von Stieglitz, Analyst, Agricultural Chemical Laboratory, to be Chemist, Bureau of Sugar Experiment Stations;

Mr. N. J. R. Barke, Chemist in Charge, Sugar Experiment Station, Meringa, to be Manager, Sugar Experiment Station, Meringa;

Mr. N. J. King, Assistant to Analysts, Bureau of Sugar Experiment Stations, to be Soils Survey Officer, Bureau of Sugar Experiment Stations;

Mr. J. H. Simmonds, M.Sc., Plant Pathologist, to be Senior Pathologist, Science Branch;

Mr. R. B. Morwood, M.Sc., Assistant Pathologist, to be Pathologist, Science Branch;

Messrs. J. A. Weddell and W. A. T. Summerville, M.Sc., Assistant Entomologists, to be Entomologists, Science Branch;

Mr. R. E. Soutter, Wheat Breeder, to be Agricultural Research Officer (Wheat and Maize);

Mr. L. F. Mandelson, B.Sc. (Agric.), Assistant Pathologist, to be Pathologist; and

Mr. H. K. Lewcock, B.Sc. (Agric.), Assistant Pathologist, to be Pathologist.

Butter Board.

In a special "Government Gazette" of the 15th November an Order in Council amending the constitution of the Queensland Butter Board has been issued.

This order provides for an election of six growers' representatives as members of the Butter Board. The election will be held on the 21st December, and a grower has been defined as any company, association, firm, or person who, during the year ended 30th June, 1935, manufactured not less than twenty-six tons of butter. This means that the butter manufacturers will elect the representatives. The basis of allocating the votes is as follows:—

(*a*) At least 26 tons, 1 vote;
(*b*) Over 26 tons, but not exceeding 100 tons, 2 votes;
(*c*) Over 100 tons, then in addition to the two votes in respect of the first 100 tons so manufactured, one vote in respect of every 100 tons or part thereof in excess of the first 100 tons.

The roll of growers shall be prepared from the records of the Department of Agriculture and Stock.

The rules for the election are laid down, and nominations close with the Returning Officer on the 28th November, 1935.

The Board is empowered to license persons who manufacture or trade in butter, and the conditions of such licenses are outlined, as well as the powers of the Board in this connection.

The order also authorises the Board, from a date to be later fixed, to control intrastate trade and commerce in butter throughout Queensland.

A method of equalisation which can be adopted by the Board, if it is found necessary, is also embodied in the order.

Maximum Numbers of Birds which May be Killed in One Day.

An Order in Council has been issued in pursuance of the provisions of the Animals and Birds Acts prescribing the maximum numbers of birds which any one person may take or kill or have in possession in one day during an open season, namely:—Twenty wild ducks, twenty-five quail, and two scrub turkeys. Previously, similar provisions applied to wild geese, pigeons, plain turkeys, and plovers, but these birds are now totally protected.

Butter Board.

The result of the voting in connection with the election of six growers' representatives on the Queensland Butter Board was as follows:—

	Votes.
William James Sloan (Malanda)	561
Robert Morris Hill (Bororen)	543
James McRobert (Maryborough)	501
Thomas Flood Plunkett (Beaudesert)	473
Adolph Gustav Muller (Fassifern Valley, Kalbar)	418
James Purcell (Toowoomba)	403
Frank Augustus Cushon (Wyreema)	301
Ernest John Cannell (Toogoolawah)	147
James Edward Nussey (Warwick)	145

Rescission of Cheese Board Regulations.

Regulations under the Primary Producers' Organisation and Marketing Acts, relative to licenses to trade in cheese, which were issued in February, 1927, have been rescinded, as this matter is fully covered in the Order in Council dealing with certain amendments of the Cheese Board constitution which was issued last month.

Cotton Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts amending the Order in Council constituting the Cotton Board. The amendment provides that, in connection with referenda or elections in connection with the Cotton Board, a person shall vote for the district in which his cotton has been grown, but in no case shall a person be eligible for or exercise more than one vote, even though he has grown cotton in more than one district. Furthermore, where a person has grown cotton in more than one district he shall vote for the district in which he has the greatest area of cotton.

Commodity Board Vacancies.

A regulation has been issued under the Primary Producers' Organisation and Marketing Acts which empowers the Minister, in the event of a vacancy on a Board arising from the death, retirement, or resignation of any member thereof, to appoint some person to fill the vacancy, or direct that an election be held, in which case the election shall be held in manner provided in the regulations for the conduct of elections and the Minister shall appoint the person elected to fill the vacancy. The member so appointed shall hold office only until the time of the next general election for members of the Board.

Lake Clarendon Animals and Birds Sanctuary.

An Order in Council has been issued under the Animals and Birds Acts revoking an Order issued in March, 1900, which declared Lake Clarendon and a strip of land ten chains wide around the border of the lake to be a sanctuary for the protection of native animals and birds. The Order issued to-day declares the Lake Clarendon Pasturage and Recreation Reserve, together with an area contained in portion 12v adjoining the reserve, to comprise the sanctuary. Mr. J. M. Fitzpatrick, of Lake Mount, Lake Clarendon, via Gatton, has been appointed an Honorary Ranger for the sanctuary.

Wild Life Protection at Lowmead.

The property of Messrs. Thomas Borthwick and Sons (Australasia), Ltd., "Thornhill," near Lowmead, has been declared a sanctuary under the Animals and Birds Acts. It will be unlawful for any person to take or kill any native animal or bird on this property.

Extension of Commodity Boards.

Orders in Council giving notice of intention to extend the operations of the Butter and Cheese Boards for a period of three years from the 1st January, 1936, to the 31st December, 1938, have been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts. Petitions for polls on the question of whether or not these Boards shall be continued for the period stated may be lodged with the Department of Agriculture and Stock on or before the 23rd December next.

Orders in Council have also been issued under the abovementioned Acts extending the operations of the Northern Pig and Cotton Boards, the former for the period from 1st January, 1936, to 31st December, 1940, and the latter from 1st January, 1937, to 31st December, 1941.

Roads to be Stock Routes.

Orders in Council have been issued under the Diseases in Stock Acts, declaring the Rewan Holding Road, in the Springsure Land Agent's District, and the road through Roxborough Downs and Glenormiston Holdings, near Boulia, to be stock routes for the use of travelling stock.

Sugar-cane Assessment at Mackay.

An Order in Council has been issued under the Regulation of Sugar Cane Prices Acts, which provides that the assessment which the Minister may levy on sugar-cane received at the Farleigh and Marian Mills as from the 17th May last, shall be 1¾d. per ton. An Order in Council fixing the assessment on all mills except Kalamia, Pioneer, and Inkerman Mills, at 1¼d. per ton, and at the three mills beforementioned at 2¼d. per ton, was issued on the 17th May, 1935, and the increased rate of assessment for Farleigh and Marian Mills will be made retrospective from that date. The increase is consequential upon the necessity for a survey of the Farleigh and Marian areas following an extension of the lands under cane and cultivation.

Maturity Standards for Pineapples, Papaws, and Grapes.

The Fruit and Vegetable Grading and Packing Regulations, issued under "*The Fruit and Vegetables Act of* 1927" have been amended in regard to an alteration of the maturity standards for pineapples and papaws, and for the introduction of a maturity standard for grapes.

The present standard for pineapples provides that mature fruit must contain a total sugar content of not less than twelve per centum. This has been amended to read "a total sugar content of the juice of not less than twelve per centum." The papaw maturity standard has been raised in an effort to prevent the sending of inferior fruit to the local and Southern markets.

A maturity standard for grapes has been framed with a view of preventing the practice of a few growers who send green berries on to the market very early in the season, and thereby kill the demand for later supplies. The standard introduced is similar to that in operation in New South Wales.

Stanthorpe Fruit and Vegetable Levy.

A regulation has been issued under the Fruit Marketing Organisation Acts empowering the Committee of Direction of Fruit Marketing to make a levy on all fruit and vegetable growers growing fruit and/or vegetables for market in the Granite Belt area for a period of twelve months from the 21st December, 1935.

The levy shall be applicable to all growers, as above, who send their fruit or vegetables either by rail or road in any one lot, with a minimum of ½ cwt. and upwards, and the amount of the levy shall be 3s. 4d. per ton, and a proportionate part thereof for each portion of a ton despatched in such lots.

The sums raised by the levy shall be utilised, firstly, in payment of expenses attached to its collection, and, secondly, the balance shall form part of the general funds for administrative purposes, and shall be credited to the Deciduous Sectional Group Committee.

Up to the present the only growers in the Stanthorpe district who contribute to the support of the C.O.D. organisation are those who consign fruit to Brisbane, Rockhampton, and Sydney by the special C.O.D. fruit trains. Growers who send their fruit to markets outside the cities named, whether by ordinary train or motor lorry, contribute nothing to administrative costs, though they receive all benefits apart from those of the special trains. All growers will now contribute towards administrative costs. The levy does not include any expenses incurred by the running of the fruit trains, such as loading and receiving, these items being charged only to those growers receiving this service.

Dairy Products Stabilisation Board.

An Order in Council has been issued under the Dairy Products Stabilisation Act further extending the Queensland Dairy Products Stabilisation Board until 31st January, 1936. Mr. J. Purcell (Toowoomba) has been appointed Chairman until such date.

Carriage of Bananas.

A regulation has been issued under the Fruit Marketing Organisation Acts revoking a regulation dated the 15th December, 1928, and relating to the protection of bananas in transit from growers' plantations to the rail head for forwarding to market. It is specified therein that any cart, wagon, or other vehicle used for the transport of bananas shall be specially constructed for the purpose and so fitted as to protect the fruit from rain and sun, such protection to allow a minimum air-space of 12 inches above the top layer of fruit or cases, or be provided with a dust-proof and weather-proof covering, such as a tarpaulin or similar contrivance, which covering should likewise allow a minimum air-space of 12 inches above the top layer of fruit or cases. The covering must be kept securely fastened, and opened only when necessary to add further loads of bananas en route, or on arrival at the place of unloading.

Canegrowers' Executive.

The regulation under the Primary Producers' Organisation and Marketing Acts covering the qualifications and disqualifications of persons for election as members of a District Canegrowers' Executive has been amended to provide that a paid officer of a district executive shall be disqualified from being elected to and from continuing to be a member of any executive.

Cheese Board.

An Order in Council issued under the Primary Producers' Organisation and Marketing Acts has received the approval of the Executive Council to-day, and will be published in a special "Government Gazette" dated the 22nd November.

The Order provides for an election of three growers' representatives as members of the Cheese Board. The election will be held on the 23rd December, and a grower has been defined as any company, association, firm, or person who, during the year ended 30th June, 1935, manufactured not less than 26 tons of cheese. This means that the cheese manufacturers will elect the representatives. The basis of allocating the votes is as follows:—

(*a*) At least 26 tons—one vote;
(*b*) Over 26 tons, but not exceeding 100 tons—two votes;
(*c*) Over 100 tons, then in addition to the two votes in respect of the first 100 tons so manufactured, one vote in respect of every 100 tons or part thereof in excess of the first 100 tons.

The roll of growers shall be prepared from the records of the Department of Agriculture and Stock.

The rules for the election are laid down, and nominations close with the Returning Officer on the 7th December, 1935.

The Board is empowered to license persons who manufacture or trade in cheese, and the conditions of such licenses are outlined, as well as the powers of the Board in this connection.

Protection of Wild Life.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) has announced that an Order in Council has been issued revising the periods of protection for native fauna throughout the State. Total protection has in the past been afforded to a number of our native birds, and in the case of others partial protection has applied.

The Order in Council now provides that the Burdekin Duck, Doves, Eastern Curlew, Golden Plover, Native Goose, Honey Parrots, all other species of Parrots (except Quarrion, Budgerigar, King, and Rosella), Native Pigeons, Plain Turkeys, Plover, Rail, and True Coot, which have hitherto been protected for seven months annually, are now included in the list of totally protected birds.

Provision is also made that wading birds, in respect of which the protective period has extended from the 1st September to the 31st December, shall now be protected from the 1st October in each year to the 30th April in the following year. The protective periods for Duck and Quail will in future be fixed annually by Order in Council.

The revision of these periods of protection has been supported by various associations and public bodies who are directly interested in the propagation of our native animals and birds. In addition to the necessity for the cultivation of a public spirit in the protection of our national fauna, it is now essential that every effort should be directed towards propagating and protecting those insectivorous birds which are of considerable value to the State from an economic point of view. This has been emphasised only recently in Northern Queensland, where measures to protect insectivorous birds are widely advocated and are in process of adoption.

In addition to protection afforded to native birds under the Order in Council recently issued, it is proposed to establish further bird sanctuaries in sugar-growing districts and on the Atherton Tableland, where insect pests are a menace to the agricultural industry.

Amended Dairy Legislation Now in Force.

The Minister for Agriculture and Stock, Mr. Frank W. Bulcock, has announced that under an amendment of the Dairy Produce Acts assented to on the 5th December no supplier of milk or cream could divert the whole or portion of his supply of that commodity from the factory which he was supplying without giving twenty-eight days' notice to the factory manager of his intention to do so. Further, a supplier of milk to a cheese factory must have his dairy premises in compliance with the requirements of the Act for the supply of cream before he could supply a butter factory. It was incumbent on the owner of a factory to notify the Department of Agriculture and Stock each month of the suppliers who cease or commence to supply dairy produce during the month preceding that in which the notification was furnished.

Farmers' Assistance (Debts Adjustment) Act.

A Proclamation has been issued under "*The Farmers' Assistance (Debts Adjustment) Act of* 1935" extending the time for the receipt of applications for assistance under such Act at the Agricultural Bank until the 31st March, 1936.

Papaw Levy.

The Papaw Levy Regulation which was issued on the 23rd December, 1933, for a period of twelve months and extended until the 31st December, 1935, has been again extended for another year from the 1st January, 1936.

Committee of Direction of Fruit Marketing.

Executive approval has been given to the issue of an Order in Council and regulations dealing with the matter of the extension of the provisions of the Fruit Marketing Organisation Acts for a period of five years from 1st January, 1935. Notice is given of intention to extend the Acts, and a poll on the question may be demanded by a requisition of 500 fruitgrowers. This must reach the Department not later than 12 noon on 31st January, 1936.

For the purpose of the requisition and ballot a fruitgrower is any person who at any time since 30th June, 1934, has been a member of a Local Producers' Association in a fruitgrowing district approved by the Committee of Direction and who has had not less than 1 acre of land wholly occupied with fruit trees or fruit plants which are cultivated for the purpose of supplying fruit to market. It will also include any person (not a member of a Local Producers' Association) who at any time since 30th June, 1934, has not had less than 1 acre of land wholly occupied with fruit trees or fruit plants which are cultivated for the purpose of supplying fruit to market, and who makes application before 31st January, 1936, to the Under Secretary for Agriculture, Brisbane, asking to be considered as a registered fruitgrower. In this application he should state the number of acres of each kind of fruit he has growing. It will not be necessary for a member of a Local Producers' Association to make application.

In the event of a petition being received the question that will be submitted to fruitgrowers is:—

> "Are you in favour of the continuance of the operations of the Fruit Marketing Organisation Acts for a further period of five years as from 1st January, 1935?"

The ballot, if any, will then be arranged for, and if one-half of the votes are in favour of the continuance the provisions of the Acts shall cease to be operative. If, however, no requisition is received, or if one is received and there is a majority vote, then the Acts shall continue for a further period of five years.

Rhodes Grass for Burnt-out Country.

Reports have been received of the effect of the recent bush fires in the Tara district by the Minister for Agriculture (Mr. Frank W. Bulcock). These indicate that an extensive area of ringbarked scrub country had been burnt out, and that both old and recently ringbarked country was affected by the fires.

It is generally recognised that if a fire passes through ringbarked brigalow country before the trees are absolutely dead there is always a danger of a prolific crop of suckers springing up from the root system, which retains its vitality for some time after the trees appear to be dead. One method of coping with young brigalow suckers adopted by selectors whose country is protected by dog-proof netting is to stock it with sheep, but the obvious thing to do under the present circumstances is to promptly sow Rhodes grass on the burnt-off scrub country as soon as possible. Given suitable growing conditions the grass will make rapid growth during the warm weather; the development of the suckers will be materially checked, and stocking can soon be resorted to.

Last year special provision was made under the Agricultural Bank Acts for the purchase of grass seed, also for the purchase of stock, and should any of the settlers on this recently burnt-off country require financial assistance—for instance to enable them to buy seed—prompt application should be made to the General Manager of the Bank or to the nearest Bank Inspector.

It is to be expected, also, that some of the new settlers will be concerned about supplies of fodder, and should any of them find it necessary to apply for seed or quick-growing summer fodder crops, such as White Panicum, Japanese Millet, Sudan grass, &c., for sowing right on top of the ashes of the burnt-off country, every consideration will be given to any applications which may be submitted to the Bank.

VALEDICTORY.

Mr. J. P. ORR.

PLATE 26.

Under the age limit provisions of the Public Service Act, Mr. James P. Orr, Registrar of Co-operative Associations, has retired from the Department of Agriculture and Stock, in which he served for fifty-two years.

Mr. Orr entered the Queensland Public Service on 1st February, 1883, commencing as a junior clerk in the Office of the Chief Inspector of Stock. Since then he has served with distinction in a number of responsible positions under fourteen Ministers.

As a very young man Mr. Orr's proficiency was recognised by his appointment to the secretaryship of the Stock Board, and in that capacity he later became associated very closely with the general progress of the Stock Branch. When the tick invasion was at its height he was made Secretary of the Board of Stock Commissioners appointed to inquire into methods of checking and mitigating the effects of that menace to the cattle industry, and the alignment of quarantine areas. He was concerned on the administrative side also with other important investigations into animal pest and pathological problems. Among other important posts held by Mr. Orr in the course of his long and honourable official career were those of Chief Clerk in the Stock Branch and Deputy Registrar of Brands, Deputy Chief Inspector of Stock, and Chief Clerk of the Department of Agriculture and Stock. At the time of his retirement Mr. Orr was Registrar of Co-operative Associations, with which he combined the office of Departmental Librarian. To those who served under him he was ever the guide, philosopher, and friend.

In sporting circles it may be said without exaggeration that Mr. Orr's name is a household word. His is a familiar and popular figure on the cricket field to many thousands of enthusiasts. He was one of the original trinity that formed the Queensland Umpires' Association, and as a member of that body umpired many international (including Tests), interstate, intertown, and final premiership matches. He also interested himself keenly in Rugby Union football; he was Vice-President of and delegate for the South Brisbane Electoral Club on the old Rugby Union Committee, on which he sat for about eight years. In his younger days he was very prominent also in musical and dramatic circles.

At a valedictory gathering of his fellow officers presided over by the Minister, Hon. Frank W. Bulcock, a very fine tribute was paid to Mr. Orr's work and worth during his official career, and cordial appreciation of his high personal qualities, as expressed by the Minister, found unanimous approval. Mr. Orr carries with him into his well-earned retirement from Departmental life the high esteem and warm regard not only of his colleagues, but also of a host of friends outside the Public Service.

Rural Topics.

Feed and Weed.

No excuse is offered for repeatedly referring to this matter of feeding the dairy cow, because I know from personal experience that there is no other matter that is of such vital importance to the dairy farmer, whose motto should be "feed and weed."

It is to be hoped that those who, hitherto, have been careless in the matter of providing supplementary food, and more than willing to listen to the advocates of the "scrap the plough" and "the pastures are sufficient" doctrines, will benefit by the severe lesson they are now having, and recognise once for all that those occasional lean times are as certain as death itself, and will continue to make a periodical appearance.

A cow is simply an engine for manufacturing milk, and, like the steam engine, must be supplied in the first place with sufficient fuel or fodder to move her body from place to place. This fuel or fodder is called a maintenance ration, but if we would have the cow become a profitable producer of milk throughout the season, she must be supplied with a great deal more fodder or fuel than is included in the maintenance ration, otherwise she would remain just as unprofitable as the engine that has only sufficient fuel fed to it to move its own machinery. Such an engine would be a dead loss to the owner. If it means a loss to the farmer to supply only a maintenance ration to his herd, the loss from supplying less than a maintenance ration is obvious.

Dairy farmers rightly interest themselves in the improvement of dairying methods, improving the dairying capacity of the herd by breeding and culling, improving the pastures by top-dressing and subdivision, improving the quality of the milk and cream by more careful handling and by better methods of manufacturing them into butter and cheese, improving the method of advertising and selling the produce, &c., &c.; but what does it all amount to if the fountain head of all, which is the cow, has occasionally to exist on very scanty rations or even die of starvation?

Too often the provision of ample food is looked upon as a trouble and unnecessary expense; but surely the experience of the present time and of similar times in the past should convince every farmer that the cheapest way to feed the herd is to provide enough food to keep the cows in good condition the year round.

It is not suggested that all dairy farmers are equally guilty in this connection. Many handle their herds capably, and provide liberally for them, being fully convinced that it is the only safe road to success.—Primrose McConnell, in "The New Zealand Farmer."

To Keep Weevils Out of Stored Skins. Exd.

When skins are to be stored for some time, especially in the summer months, it is advisable, as soon as possible after they have cooled off, to paint the pelts with some solution to keep away weevils and other pests, which do considerable damage by eating into them, thus reducing their value. Once the weevils get into the skin it is a difficult matter to remove them, and the longer they remain the more damage they do. Care must be taken to paint the pelt thoroughly, as unless this is done the weevils get in at the points and in small pockets and soon riddle the whole piece.

Cheap and effective mixtures for this purpose are made up as follows:—

1. Arsenic, 4 oz.; soda crystals, 8 oz.; water, 1 gallon. Boil all together until dissolved, and when cool apply with a soft brush.
2. Arsenic, ½ lb.; soda, ½ lb.; water, 1 gallon. Boil for half an hour.
3. Arsenate of soda, 1 lb.; water, 4 gallons. Boil together.
4. Soda ash, 5 lb.; Barbadoes aloes, ¼ lb.; water, 4 gallons. Boil together, and when the mixture rises pour in 1 gallon of cold water. One part of this stock solution to five parts of water would be the proportion to use when required.

All of these mixtures are highly poisonous, and must be legibly branded as such. When not in use, keep under lock and key.

These mixtures are also used for painting dry hides and all descriptions of marsupial skins. Paint the pelts with the solution, using an ordinary whitewash brush. Be careful to see that the pelts are thoroughly dry before bundling, as wet skins soon go mouldy and depreciate in value.

"Intensive" Dairy Farming.

Mr. E. J. Hayes, who dairies at Nesward, Taree, North Coast of New South Wales, has demonstrated the remarkable production qualities of well-bred Jerseys on small areas. At Nesward, on 33¾ acres, Mr. Hayes grazes 17 cows, which last year produced 5,693 lb. of butter (actual factory returns), an average of 335 lb. of butter a cow, and 167 lb. of butter an acre. In addition, he grew all the fodder required for the upkeep of the herd, obtained £70 revenue from pigs and calves, £50 from pumpkins and other vegetables, and £52 from eggs and poultry. These figures he expects to greatly increase when stall feeding can be carried out.

At present there is an excellent stand of 5 acres of lucerne, 1 acre of peas, 1 acre of saccaline, 1 acre of orchard, 5 acres of maize, and 1 acre of pumpkins. Hawkesbury College blood forms the basis of the herd.

New Grazing Methods.

Mr. Max Henry (Chief Veterinary Surgeon of the Department of Agriculture, New South Wales) stated in an interview recently that the steady deterioration of natural pastures under conditions of continuous grazing without renovation was making it more necessary for graziers to grow crops to feed in dry seasons as conserved fodder.

Stock which approached winter in strong condition, it had been found, would live through on an extraordinary low diet and be in a position to respond quickly to the spring growth. On the other hand cattle that entered winter in an under-nourished condition had suffered heavy mortality, not merely through semi-starvation during periods of extreme dryness, but because when the rain did come and promote a flush of feed the tone of the digestive system was so low that they could not avail themselves of the food offering, and the tendency to scour provided the finishing touch.

In the eastern half of New South Wales there were few properties on which something could not be done to put together a store of feed to be used as a regular ration for the stock to augment the grazing.

The bogey of expense, he said, was too often raised with regard to supplementary feeding, and yet in many cases once the food was stored the expense of utilising it was practically nil. There was no expense in giving stock free access to a haystack or trailing maize for sheep. Feeding stalls for cattle need be of the simplest design, and could be constructed by the farmer himself. Feed boxes or bags slung between battens were very cheap. The only real expenditure involved was that concerned in the production of the fodder, and it would not take the value of many animals, particularly cows, to recoup that outlay.

It was extraordinary what a small quantity of supplementary food was necessary, providing it was available early enough. In one case under his notice the supply of five bags of maize per 1,000 sheep each week, increased to ten bags a few weeks later not only stopped mortality, but resulted in an amazing improvement in the appearance of the fleece. On the same property, which was heavily top-dressed, it was the practice to build meadow haystacks regularly in the paddocks. These were available to the stock, and when the grazing was good they were scarcely touched, but as the pastures became depleted the stacks were more and more used until they were finally eaten to the ground. This provision was only possible when the property was reasonably subdivided, and without subdivision of paddocks no system of supplementary feeding would be really successful.

A Biblical Rebuke—When Wheat Realised 15s. a Bushel.

A story told to Rev. James Hassall, who repeats it in his book, "In Old Australia," is worth re-telling. The story concerned an old pioneer, of Goulburn, New South Wales. In the mid-forties of last century, when wheat was abundant, and was selling at 18d. a bushel, he purchased all he could procure at the price, and stored it in huge silos, which he was the first to erect in the Goulburn district. Three years later there was a drought, and he was offered 15s. a bushel for his wheat, but declined to sell at less than £1 a bushel. The same evening, when reading his Bible, he saw in Proverbs xi., 26, "He that witholdeth corn, the people shall curse; but blessing shall be upon the head of him that selleth it." The old farmer took the admonition seriously, felt remorse, and at once drove into Goulburn and sold all his wheat at 15s. a bushel. It was carted to the mills at once, but before the flour was sold from this wheat two ships with cargoes of wheat arrived in Sydney from New York, and the market price fell to 6s. a bushel. One would be sure that the dealer in wheat became a keen student of the Bible after that, and never forgot how nearly he missed the market.

Bracken Control.

Because of its ability to spread rapidly over the ground by means of running stems or stolons, kikuyu grass can be a valuable ally to the grazier in the coastal areas where bracken fern has become dominant.

Fern country on which it is intended to grow kikuyu should be worked and ploughed prior to planting in the spring, or, if the soil be of an open, free nature, the fern fronds should be cut in the early spring, burnt, and the grass roots hoed in. On large areas drills 3 feet apart should be struck out with a single furrow plough, and kikuyu roots or cuttings dropped every 3 feet and covered with a light furrow or by running a harrow along the drills in the direction in which they run.

Under favourable weather conditions the kikuyu grass makes headway as soon as, or before the fern, and by the following spring a mat of grass will have gradually choked out the fern, assisted by the cattle, which tramp down the bracken while feeding on the grass. The grass should be allowed to become well established before being fed off, as the stock may tear up the runners if not well rooted.

To ensure a better balance of feed 4 lb. of white clover an acre should be broadcast over the area during the autumn of the early period of establishment of the kikuyu and lightly harrowed in. Top-dress with 2½ to 2 cwt. of superphosphate an acre in the autumn each year. Planting on land that may subsequently be required for cultivation is not recommended, as once established the kikuyu is difficult to eradicate.

Kikuyu provides excellent feed and, though mainly a summer grower, it withstands dry weather better, remains green longer, and provides a greater bulk of feed during the winter months than does paspalum.

The grass grows rapidly, and the roots sent out from each joint anchor the grass firmly in the ground, at the same time forming a dense turf that will stand the tramping of heavy stock well. Its ability to bind the surface of the soil also makes it of value in preventing soil erosion on creek banks and hillsides.—"The Australasian."

Keep Farm Stock Healthy.

Serious losses occur among stock, particularly young stock, from both infectious and non-infectious complaints through lack of attention to the principles of good hygiene. There is too often a tendency on the part of the farmer and stockowner to regard veterinary science as only capable of coming to his aid when stock are already sick, forgetting that the most valuable part of veterinary advice is that dealing with prevention, and that it is along these lines that the future development of the science will be most marked.

This attitude of the farmer is due to the fact that throughout the earlier years of Australian colonisation and settlement stock practically looked after themselves, and the question of good or bad hygiene never had to be considered. But to-day, in the settled parts of the country—particularly in dairying districts, on pig farms, in irrigation areas, in poultry-farming areas, and wherever stock are under more or less confined and artificial conditions—the question of good hygiene becomes one of the first importance. The prevailing opinion among farmers appears to be that good hygiene is a kind of fad—bred by Science out of Laboratory—but of no kind of use to the man making a living out of stock. Nothing could be further from the truth, though it is admittedly difficult to say at what precise moment the observance of good hygiene puts a "fiver" in a banking account.

It is also argued that because stock thrived in the old days under such-and-such conditions they must do all right now. To hold such opinions a man must have forgotten many things; such things as the actual changes which have taken place in conditions, the greater economic value of the individual animal, the totally different position as regards disease, and the fact that as this country progresses these changes in every way will become more and more marked. It is wiser to look ahead to what we have to do than to look back on what our grandfathers did; and it is of far more value to the farmer to understand what good hygiene means than to possess any number of isolated and more or less correct ideas as to the treatment of sick stock.

The treatment of sick stock is of value at long intervals—good hygiene is of value at all times. Even in parts of the State where stock are running freely in wide areas, certain aspects of the question are of considerable importance. By good hygiene is meant the correct application of those systems of stabling, housing, grazing, sheltering, grooming, clipping, clothing, feeding, and watering which are most conducive to the good health and economic efficiency of the animals.—"A. and P. Notes," New South Wales Department of Agriculture.

Lucerne Invaluable—A Pastoralist's Opinion.

In the opinion of Colonel H. F. White, of Bald Blair station, in New England (New South Wales), lucerne is the most valuable of all leguminous pastures, the hardiest herbage plant known, and has the widest range of adaptability to grazing conditions in Australia. The cultivation of lucerne he believes will be the ultimate solution of the wheat men's difficulties, enabling them to reduce their areas under wheat and to profitably replace them with grazing pastures for the production of mutton and beef.

The idea that lucerne only thrived in soil through which its roots could penetrate to water was a mistaken one, he said. At Bald Blair, he had a seven-year-old stand of lucerne sown in conjunction with phalaris, growing on soil that was not a foot deep, and had an underlying bed of impervious rock. This season following one of the driest winters ever experienced in New England, the lucerne was showing more growth than any other pasture plant on the property, and was as vigorous to-day as could be desired.

To have the best balanced pasture it was necessary, he believed, to establish legumes with the grasses, and he had found lucerne the king of the legume family, and a valuable ally that further improved the pastures by crowding out the weeds. At Bald Blair he had had splendid results from lucerne sown with phalaris. Providing it was kept short during the summer it would stand grazing through the winter, and would be the first plant to respond in the early spring, when it would provide a crop for hay.

It had been found possible to grow lucerne successfully on the extreme west of the wheat belt in the north-west of New South Wales, where a grazier was to-day cultivating it along the lines of the dry farmers in California. The seed was sown in rows from 3 to 4 feet apart at the rate of 1 lb. to the acre. The soil was well worked between the rows, thus forming a surface mulch that minimised evaporation, and at the same time permitted the maximum absorption of slight showers and heavy dews. Along these lines, he believed that lucerne could be cultivated in the lowest rainfall districts.

Dry Mash for Pigs.

In a series of interesting experiments in the feeding of pigs, conducted in Queensland recently at the Animal Health Station, Yeerongpilly, the young pigs from seven up to twenty-four weeks of age were fed entirely on dry meal with the addition of clean drinking water, fed in a trough separate from the self-feeders containing the meal. Green food was used as it became available, paspalum grass and a mixture of green lucerne and grass being used as a mid-day snack.

The meal mixture was composed of—

Maize meal	40 per cent.
Wheaten pollard	40 per cent.
Meat meal	10 per cent.
Lucerne chaff	10 per cent.

A mineral supplement was added at the rate of 2 lb. per 100 lb. of meal, this mineral mixture being composed of calphos (a bone meal mixture) 75 per cent., common salt (fine) 25 per cent., plus powdered sulphate of iron, 2 oz. to each 100 lb. of mineral mixture.

In a previous experiment it was shown that there is relatively little difference in food value between maize meal, wheat meal, and barley meal, and it is assumed that for the purpose of feeding, wheaten meal or barley meal could replace the maize meal in such feeding.

More recently still the meal mixture has been altered, and that now being fed is made up from:—

Maize meal	80 parts
Protein meal	12 parts
Lucerne chaff	8 parts

A mineral mixture composed of ground limestone 2 parts, calphos (bone meal) 2 parts, and fine salt 1 part is added in the ratio of 2 lb. of this mineral supplement to each 100 lb. of meal, with drinking and green food as in the former trials.

It is proposed later to use pumpkins in lieu of lucerne chaff, as the latter is not always available, and in some districts is difficult to procure.

The Pig's Temperature, Respiration, and Pulse.

The temperature of the pig's body is normally 102.6°F. It varies from this to a degree or so higher, and is higher than normal in very young animals. The temperature is taken with a clinical thermometer, and to obtain correct normal temperature the animal should be normal, for its bodily heat rises after a meal or after vigorous exercise, and is, of course, higher at the time the sow is approaching or passing through her farrowing period. It is higher during humid weather and when fully fed than under the reverse conditions.

The temperature of the pig is taken by means of a clinical thermometer inserted into the back pasaage (the anus) and held there for not less than sixty seconds, and for preference a longer period if the animal is quiet and readily handled.

Care should be taken to ''set'' the thermometer before use—that is, to see that the mercury is sufficiently below the line of normal temperature of the animal's body. Care in handling is emphasised so that the results may be looked to as correct. Some experience is needed in reading a clinical thermometer, as the column of mercury is not always readily seen.

The normal respirations of the pig are about fifteen respirations per minute. The breathing is short and jerky in cases of inflammation of the lungs, but is normally undisturbed.

The normal pulse is about seventy-five beats per minute, the pulse being taken on the inside of the foreleg. The respirations of the pig are, of course, observed by closely watching the animal when it is in normal condition, not overheated or excited after a chase.

Temperature, respiration, pulse, and gait or movement are all important in the diagnosis of disease, and it should be the aim of the pig-raiser to become conversant with each. Pigs are friendly disposed, and can be trained to obey, but they should at all times be treated firmly, be well fed, managed, and cared for.—E. J. SHELTON, Senior Instructor in Pig Raising.

Productive Jerseys—Posy V.'s Australian Record.

Continuing the remarkable production performances of 273 days, which were reported last July, the Hawkesbury College Jersey cows Richmond Posy 5th and Richmond Laurel 5th have just completed the full 365 days' period, during which each produced more than 1,000 lb. butter-fat.

The figures for Richmond Posy 5th are 19,365 lb. milk, average test 6.67 per cent., equal to 1,292 lb. fat, or 1,556 lb. commercial butter. This performance constitutes an Australian record for the Jersey breed, and has been beaten on only one occasion, that being by the Canadian cow, Brampton Basilua.

The world's record for butter-fat production was first claimed by an Australian cow in 1927, when Wagga Gladys, stationed at Hawkesbury College, produced 20,835 lb. milk, equal to 1,149 lb. fat. This figure was later lowered by the New Zealand cow, Woodland's Felicie, which produced 1,220 lb. fat. In May, 1932, Wagga Gladys regained the honours for Australia with a total of 22,847 lb. milk, equal to 1,259 lb. fat. These figures were lowered in 1933 by the Canadian cow, Brampton Basilua, with the total of 19,012 lb. milk, equal to 1,313 lb. fat.

Richmond Posy 5th was born on 1st September, 1927, and to date has been submitted to five lactation tests of 365 days' duration, as follows:—

Age.	Milk. lb.	Fat. lb.	Commercial Butter. lb.
As a junior 2-year-old	10,772	636	766
As a senior 3-year-old	18,025	1,081	1,303
As a senior 4-year-old	15,865	946	1,140
As a mature cow	15,385	871	1,050
As a mature cow	19,365	1,292	1,556
Total production over five lactations	79,412	4,826	5,815

Richmond Posy 5th has now produced in excess of 830 lb. fat (equal to 1,000 lb. commercial butter) on four separate occasions. The total number of occasions on which cows of all breeds in New South Wales have exceeded this figure is fifty-five, and of these thirty-five are credited to Jerseys, twenty-five of which have been achieved at the College.

Richmond Laurel 5th as a junior four-year-old finished up with a total of 16,320 lb. milk, equal to 1,049 lb. butter-fat. The Australian record for this age over 365 days' milking is 1,067 lb. fat, a performance which was credited to May Queen of Richmond in 1930.—''The Hawkesbury Agricultural College Journal.''

"Feed the Best—Cull the Rest."

Subjoined is a leading article under the above caption taken from "The Telegraph," Brisbane, of 20th November.

"Despite the facilities offered by the Government, through the Department of Agriculture and Stock, for testing dairy cows, and despite the widening of this form of assistance, dairy farmers have been making an inadequate response. The report of the Department shows that in 1934-35 the number of cows submitted to the simple but effective means of ascertaining their value as yielders of wealth was considerably smaller than in the previous year. Altogether 24,434 cows were submitted and tested, and, as the Director observes, 'Although this service is free, the small percentage of dairy farmers who take advantage of it is remarkable.' We entirely agree. The number tested equals only about 3 per cent. of the total number of dairy cows in milking in the State. In such circumstances it is impossible to know whether these are representative of the herds as a whole, though the assumption is warranted that they are not, since they belong to the more enterprising of the dairymen, and the general average may be below that of the tested animals. However, these gave a mean return of 154 lb. of butter-fat, which is too low. The Senior Herd Tester states in his report, more than once, that it should be the aim of the dairy farmers to set a standard of 'at least' 200 lb. of butter-fat per cow, and he adds that 'unfortunately, the returns year by year do not indicate any definite improvement.'

"This melancholy generalisation rules out the influence of climate on the statistics of a single year, and proves that only a very minor percentage of the people engaged in dairying as a livelihood have been persuaded to realise the importance to themselves of testing and culling their stock. The tabulated results of what testing there was shows that more than half the cows gave an average of less than 150 lb. of butter-fat, including 13 per cent. below 100 lb. The apathy of the producers in this matter is difficult to understand, for it is palpably stupid and expensive to keep in the milking herds animals which are unworthy of their place. The Senior Herd Tester compares the outputs of two herds that were tested within a few miles of one another. One of eighteen cows yielded more butter-fat than the other of thirty-eight cows, and the officer points out that in addition to having to provide feed of some kind for the extra twenty cows, the owner of the poor herd must also employ at least one more hand to assist with the milking. He also remarks, evidently making an attempt to provoke the farmers into an intelligent interest in their job, that the records give ample evidence that the progressive farmer who makes regular tests 'is steadily showing an increase in production per cow year by year.'

"Plainly enough, there is a too great preponderance of 'passengers' in the Queensland dairy herds—animals which are not contributing to the banking accounts of their owners and should give place to better ones. The standard mentioned by the officer of at least 200 lb. of butter-fat per annum may be mildly described as moderate; it is, indeed, a low standard which would be laughed to scorn in some of the other principal dairying countries and in some of the Australian States—Victoria, at all events. Yet the yield here, so far as has been ascertained by the testing process, is but three-quarters of the 200 lb. standard, which the Herd Tester says could be attained 'without much trouble' if only 'owners would look on dairying as a business proposition—feed the best and cull the rest.' The officer's remarks warrant a further quotation: 'The market price for our produce is not likely to increase materially for some time to come, and if our dairy farmers are going to remain in business it is necessary for them to raise the average production per cow. Unfortunately, the producer has no say in the world market prices, but he can improve his income considerably by increasing the average production of his herd.'

"To this we may add that the dairy people certainly do influence the domestic market. The consuming public pays a considerable toll so that the surplus butter may be profitably sold abroad. In this respect dairying is one of the 'sheltered' industries. It therefore owes to the public the duty of efficiency. One of the stoutest claims on behalf of the sugar agreement is the high state of efficiency on the canefields and in the mills, and nothing is left undone to justify the claim. Were the butter producers of this State challenged by the consumers they would be unable to support their case as a deserving one in face of the neglect of the herds, the apathy towards testing and culling, the indifference displayed as to the quality of the animals employed in what is, notwithstanding these grave defects, a great and a growing pursuit. We make the suggestion that the energetic Minister for

Agriculture and the officers of his Department should make a special effort to stir up the dairy farmers, encourage them to look upon their industry as a business proposition, and urge them to study their own pockets by weeding out the cows that are not worth their keep and replacing them with the best stock they can obtain or afford. That is common sense and practical economy.''

Improving the Dairy Yield—Facts must be faced.

In the course of a recent Press interview, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, made the following observations on the dairy industry:—

''While the sugar-grower contributes some £5 for sugar organisation, the dairy farmer contributes scarcely as many shillings, and any effort to promote efficiency by scientific herd-testing is often regarded in a very jaundiced way.

Economic Losses.

''The dairy industry cannot succeed unless it is determined to cut out avoidable economic loss. These losses may be stated under two headings: (1) Loss due to pathological causes; and (2) loss due to the very charitable practice of entertaining bovine boarders.

''The Department of Agriculture and Stock offers a service in respect of both these difficulties. We have as the headquarters of the organisation on the pathological side the Animal Health Station at Yeerongpilly, and here are research workers and routine men dealing with pathological problems and their remedies. An extensive field staff is maintained in order to keep a close co-operation between the farmer and the Department.

No Charge for Testing.

''The second factor is the unprofitable cow. Queensland is the only State in the Commonwealth that is not making a specific charge for the service of testing, and it does not refuse to test any herd providing that the applicant agrees to the conditions of the test. When we have had the opportunity of testing a herd over a number of years an improvement has taken place.

''As 'The Telegraph' truly remarks, the more progressive farmer associates himself with departmental practice.

''One often hears the argument that we cannot obtain butter-fat equal to other countries owing to our climate. But can we increase the commercial butter-fat yield per cow within the State?

''All our records show that this can be achieved once we get the co-operation of the dairy farmer.

Progress Achieved.

''In order to enlist the sympathy of the dairy farmer we have during the past two years held classes for dairy farmers at the Department and at Yeerongpilly, the department making a contribution towards the payment of fares and maintenance while in Brisbane.

''This scheme, which has been an unqualified success, has undoubtedly brought the farmer in better relationship with the Department. The scheme would be pursued in conjunction with field days, when officers of the Department meet farmers on their own localities and endeavour to emphasise the necessity for action so far as economic loss is concerned.

''Many factories in Queensland have associated themselves with this movement, and many factories at my request are prepared to conduct tests of supplies, and this organisation is designed to make it easier to eliminate the cow that does not pay its way.

Hopeful Sign.

''The most hopeful sign at present is the growing appreciation of the work of the Department amongst the primary producers generally. I think it is safe to assume that a big body of farmers realise that problems that they individually cannot tackle may be effectively assailed by co-operative activity, which means the activity of the Department.''

Artificial Silk Production.

The latest available returns from countries officially recording the manufacture of artificial silk are, in tons produced in a year:—United States, 93,000; Japan, 44,000; United Kingdom, 38,000; Italy, 37,000; Germany, 30,000; France, 25,000.

Action of Acids on Cement.

Observation of the effect of lactic and other acids on the cement mixture in concrete pig troughs, on concrete floors, &c., indicates that unless some acid-proofing mixture is applied at the time the work is being carried out the acids in pig food will, in due course, cause the cement to dissolve, and the bed of the troughs, floors, and other cement surfaces to crack and crumble. Some measure of protection against the action of such acids is afforded by coating the concrete troughs, floors, and drains with a solution of silicate of soda. To prepare the mixture add 1 gallon of quartzite silicate of soda to every 4 gallons of water required, and just as the concrete or finishing coat is beginning to set apply the solution by brushing or spraying, according to the manufacturer's instructions. Just as much should be put on as can be absorbed, for if too much is used the concrete will remain permanently damp. Three coats are required, at intervals as directed by manufacturers. The material referred to may be purchased from hardware stores or may be ordered from wholesale houses dealing in paints, lime, &c. The cost is somewhere about 5s. per gallon tin, 1 gallon being sufficient to cover quite a large area. If care is taken to apply this acid and waterproofing mixture good results may be expected.—E. J. SHELTON, Senior Instructor in Pig Raising.

Prize-winning Pig from New Zealand.

The successful utilisation of the New Zealand and Canadian strains of Large White pigs in Queensland has induced Mr. J. A. Heading, of Highfields Stud, Murgon, to import from New Zealand the sow Grinton Sunbeam. This breeder's previous experience with New Zealand pigs of Canadian strain has been most satisfactory, his first importation, Pine Terrace Pear, having been champion at the Brisbane Show for the last two years. Several of the progeny of this animal have also won many prizes.

Grinton Sunbeam is bred from Canadian stock, and was mated to a New Zealand boar of Canadian strain. Her progeny should be a valuable addition to Queensland studs, which are founded either on English or on Canadian strains. In New Zealand Grinton Sunbeam won seven first prizes, two of which were won as a baconer, indicating that she is of a desirable trade type. Her sire, Kismet Character, was a prize winner, and her dam, Grinton Mistress IV., won several first prizes, and reared a litter of ten pigs, averaging 40 lb. each when eight weeks old. Sunbeam apparently inherits her dam's breeding capacity, for on her first litter, last March, she produced fourteen pigs.

Points for the Maizegrower.

Cultivation of the growing maize crop is essential for two main reasons—firstly, for the destruction of weeds, and secondly, for the conservation of soil moisture. Harrowing the young crops is the first necessity, as it destroys young weed growth, particularly in the rows, aerates, warms, and mulches the soil, and gives the young plants a quick start. As the crop grows it should be inter-row cultivated wherever weeds appear, or the soil becomes crusted, but such cultivations should cease when the crop reaches the tasselling period.

The depth of cultivation is very important. Cultivation of the established plants must not be deep. No harm is done if deep cultivation is practised in the early stages of growth, provided it is not too close to the plants, but from when the plants are 18 to 20 inches high only shallow cultivation should be given, as, the plant being a surface feeder, the roots extend across the rows and within 3 or 4 inches of the surface.

The disadvantages of hilling outweigh the advantages, and as a general practice it cannot be recommended. A light hilling may sometimes be necessary to smother weed growth or as an aid to drainage on low-lying lands, but the damage done to roots, the possibility of "gullying" on slopes, and the greater surface exposed for evaporation are all against the practice, while the support given to the stalks by hilling is not so important as is usually thought. Throwing a big hill with the plough is still often practised, but cannot be too strongly condemned.

It is not necessary to remove the suckers from growing maize crops. This practice, adopted by many farmers with the idea of increasing yield and incidentally providing a little fodder for stock, actually decreases the yield, as proved in an experiment conducted at Grafton Experiment Farm over a period of four years.

When Did the Foxes Come?

Referring to a recent paragraph on this subject, Mr. T.P.A., of Belgrave (V.), says that the first fox he ever saw was on the Wooloomanata Estate, Lara (V.), in 1878. It was on the boundary of that property and the Brisbane Ranges Estate. Foxes in those days were said to be escapees from the Werribee Park Estate, which was owned by Messrs. Andrew and Thomas Chirnside. They, it was said, had imported the foxes for hunting. They kept a pack of beagles, and gave many runs across country.—ALEC. H. CHISHOLM, in "The Australasian."

British Beef Statistics.

According to Mr. H. Burton, who writes from Stott Park, Ulverston, Lancashire, whose remarks are published in "The Australasian," the meat markets of Great Britain have absorbed an average of 721,000 tons annually of beef and veal, including cattle imported on the hoof, during the last seven years, in addition to an average of 609,000 tons of home-grown supplies. In Great Britain there are approximately 8,700,000 head of cattle, and the annual slaughterings amount to 2,800,000 head, which produce about 600,000 tons. The annual consumption of beef and veal in Great Britain is 65 lb. per capita, compared with a per capita consumption of 57 lb. in Canada, 107 lb. in Australia, 160 lb. in New Zealand, and 203 lb. in Argentina. The exports of cattle from Ireland average about 700,000 head, and chilled beef and frozen beef and veal exports from South America average more than 500,000 tons. The slaughterings in South America average approximately 6,000,000 head yearly, while the slaughterings of cattle and calves in Canada are about 1,700,000 head, in New Zealand 1,500,000 head, and in Australia about 2,200,000 head.

Belt-driven Machinery.

Mr. G. F. Young, of Apollo Bay (Victoria), in a letter to "The Australasian," gives the following interesting experiences with farm machinery:—The percentage of power absorbed by the belt transmitting the energy from the engine to the pump, chaffcutter, saw, or other machine is a factor often ignored on the farm. This loss of power is, of course, money wasted, and though unavoidable, it need not be aggravated. We all know of high-speed tools and appliances driven by belts that take only a fraction more horse-power while in use, but the gear driving them eats up far more fuel and oil than the work being accomplished. Let me illustrate by describing two instances on my own farm where, by getting away from the books and doing things an engineer would not approve of, I saved myself some cash outlay and economised on kerosene.

We have a 2-h.p. English Crossley oil engine. To use it to drive a circular saw that should have a 10-h.p. engine seems on the face of it impossible. But we did just that quite successfully. By substituting petrol for kerosene with the little necessary valve adjustment, screwing down the governor spring and so speeding up from 400 to 500 revs. (no risk with a good English job), we develop, say, 4 h.p. By using a nice, thin, pliable leather belt 3 inches wide instead of 6 inches, as advised by the maker of the saw bench, we can cut up our firewood comfortably. That is, we do not waste more power than absolutely necessary driving a heavy belt at high speed round two small pulleys. The belt may not last as long, and an engineer will tell you it is being pulled to pieces, but we have only an hour's work a week for the saw, and so far the belt, after eight years' work, is apparently as good as new. And we have saved a lot of kerosene and cash outlay on a bigger engine.

Another job this same engine does is to drive a small pump. Here we had to invert the plan just mentioned. We use a 6-inch belt where a 3-inch, or even a 1-inch would do the work better. This may seem contradictory, but it is not so. Several factors enter into the problem of driving this pump. Firstly, it is only 10 feet away from the line shaft, secondly, it makes only twenty-five strokes a minute, and lastly, we only want it for emergency work a few hours a week in January and February. The 6-inch pulley drives on to a 30-inch pulley to reduce speed, and, being so close, the belt must be tight to avoid slip. So we must use a wide belt to give all the gripping surface possible.

Any practical man will see the advice involved in these two instances of the "misuse" of belting. Both were special cases, but similar problems exist on most farms and stations. Belting, for many drives, still remains the best medium to transmit power. There are belts on the market that have a long life, but as a gift they may be dearer than leather. They absorb more energy in driving. As I am interested in keeping the demand for hides up, I may be prejudiced when I say, "There's nothing like leather."

Lucerne Area Increasing.

Figures prepared by officers of the Condobolin (New South Wales) Experiment Farm supply striking evidence of widespread appreciation of the value of lucerne for grazing purposes. The figures show that within a radius of 30 miles of Condobolin 6,790 acres of lucerne had been established, without taking into consideration the areas grown under irrigation.

Previous to 1932 the area sown to lucerne in this district was only 412 acres. During 1932 the area was increased by 150 acres, 900 acres were added in 1933, 3,350 in 1934, and 1,978 acres so far in 1935. But for the exceptionally dry autumn and early winter, the area planted this year would have been considerably greater.

Commenting on these figurues, the State Agrostologist (Mr. J. N. Whittet) attributed the increase in the area, which is one of the relatively dry parts of the State, to the department's demonstration of light seedings at the rate of 2 lb. to the acre. He stated that the "dry" farming methods adopted on the Condobolin Experiment Farm had attracted the keen interest of graziers of the district, and he believed that largely increased acreages of grazing lucerne would be put down in the near future.

Mr. Whittet added that lucerne was now established on thirty-eight holdings within a 30-miles radius of Condobolin. The areas ranged in size from 10 to 1,300 acres; two properties had 900 acres each, while others had 640, 400 (two), 270, 260, and 210 acres, respectively. One grazier, who had established 900 acres since 1932, had announced his intention of sowing 1,000 acres each year until he had attained an objective of 5,000 acres.

Light seedings in the autumn on well-prepared fallows, Mr. Whittet believed, were the secret of success in establishing grazing lucerne stands in the low rainfall districts.

Value of Sown Pastures.

Throughout Northern New South Wales, and New England in particular, the value of sown pastures was strikingly demonstrated this season, following what is considered by many graziers to have been the worst winter on record. Stock on natural grazing suffered heavy mortality from the lack of nutrition in the native grasses, and many graziers were compelled to adopt supplementary feeding in order to keep their stock alive.

The Assistant Agrostologist of the New South Wales Department of Agriculture, after a tour of the New England districts, said that on properties where sown pastures were available stock came through the winter in good condition. Although the sown paddocks made little growth during the exceptionally dry season, some palatable green feed was always available, which combined with hay cut from the summer crops enabled the stock to maintain condition. Graziers with large areas of such grasses as *Philaris tuberosa*, perennial rye, cocksfoot, and clovers were emphatic as to their value under the extremely unfavourable conditions.

At Wallamumbi, in the Armidale district, Mr. P. A. Wright had treated about 1,000 acres of country, and, in addition to sown paddocks, had had considerable success in improving the native pastures by broadcasting subterranean clover at the rate of 2 lb. per acre with 1 cwt. of superphosphate. Hay made from the sown areas had been of great value during the winter. On a sown area of 50 acres which had been divided into two paddocks, and which was supplemented by 22 acres of ordinary grazing, sixty-one head of cattle and an average of one sheep to the acre were carried in good health and vigour from the end of April to the second week in October.

Mr. L. P. Dutton, of Urandangie, Guyra, had proved that the straw of *Philaris*, after the seed had been threshed out, was a valuable adjunct to pastures during winter. Stocks were given access to the stacks of straw in the paddocks, which they thoroughly relished.

Mr. Moodie considered that lucerne should receive much more attention from New England graziers. A pasture mixture admirably adapted to New England conditions, and which was an excellent grazing and hay proposition, consisted of 4 lb. of *Philaris*, 2 lb. of lucerne, and 2 lb. of English trefoil (*Medicago lupulina*). At Bald Blair, Mr. H. F. White had found that it produced excellent grazing at all periods of the year, and that the hay was of highly nutritious quality. The mixture should be sown on well-drained soils.

This season it had been possible to compare the Burbank selection strain of *Philaris tuberosa* with the ordinary commercial strain under extensive grazing conditions. It was generally conceded that the Burbank strain was much superior to the ordinary strain.

Saving Our Wild Life.

Thus Alec. H. Chisholm, the well-known ornithologist and nature writer, in "The Australasian":—

Publication of "Australian Wild Life," the second annual journal of the Wild Life Preservation Society of Australia, shows that this society is doing excellent work in safeguarding the fauna and flora of the Commonwealth. The journal includes articles on Australian nature books, native plants of New South Wales, and (by Walter B. Griffin) "Occupational Conservation," but most of the space is devoted to the society's annual report. This shows a fine record of public service, ranging from attempts to re-establish the koala in its native state to an account of the efforts being made to restrain people from caging wild birds that are not adapted to confinement.

Personally, I am very glad that the society is fighting so stoutly the cause of the caged bird. Doubtless birds that are kept in large aviaries, where they have space to use their wings and facilities for breeding, may be moderately content, but it seems to me that there is something wrong with the mentality of people who pen wild birds in small cages.

For this and kindred reasons I commend the work of the Wild Life Preservation Society to all who esteem the birds and mammals of Australia. The annual subscription is 5s. for men and 2s. 6d. for women, and the honorary secretary is Mr. David Stead, Science House, Gloucester street, Sydney.

Soil Erosion.

Two conditions are necessary before soil erosion can commence, says Mr. H. H. Cornell (as reported in "The Australasian") who has investigated soil erosion problems in South Africa. First there must be unabsorbed water, that is, run-off water. Secondly, the run-off water must move at a certain speed. These conditions are controlled by the following factors:—The texture and structure of the soil, physical conditions and soil surface, total amount of rain, nature (distribution) of rain, vegetal cover on the soil, and slope or gradient of the surface. Great tracts of country have been destroyed by soil erosion in South Africa, and the trouble is extending. Various steps are being taken to combat the menace. Tree planting is being undertaken. Soil-binding grasses are being sown down. Cultivation of "dangerous" country is restricted, and the growth of what are called erosion-producing crops, such as cotton, corn, and tobacco, is discouraged in some parts. Public money is being advanced on easy terms to land owners to help them arrest erosion extension.

Lamb Raising. Flock Improvement.

With the object of encouraging the expansion of the fat lamb breeding industry in Queensland, the Department of Agriculture and Stock has completed the purchase of a draft of 176 stud ewes and rams of the British breeds, most of which were selected from the studs of the Riverina district.

The purchase comprised 60 Border Leicester rams, 20 Border Leicester ewes, 20 Romney Marsh rams, 10 Romney Marsh ewes, 26 Dorset Horn rams, 10 Dorset Horn ewes, 25 Southdown rams, 8 Southdown ewes, and 2 Shropshire rams. All the sheep, which are first quality registered stud sheep, have been delivered, and their influence in the expansion of the fat lamb breeding industry will be of marked benefit to the flocks of the State.

Dairying Fundamentals.

Quality in milk and cream is not accidental—it is the result of care that conditions shall be satisfactory in a number of respects. The dairying fundamentals are:—

Healthy cows and attendants.
Wholesome feed and pure water.
Strict attention to cleanliness.
Prompt cooling.
Protection in transportation.
Frequent delivery to the factory.
Absence of feeds and weeds that produce objectionable odours and flavours.

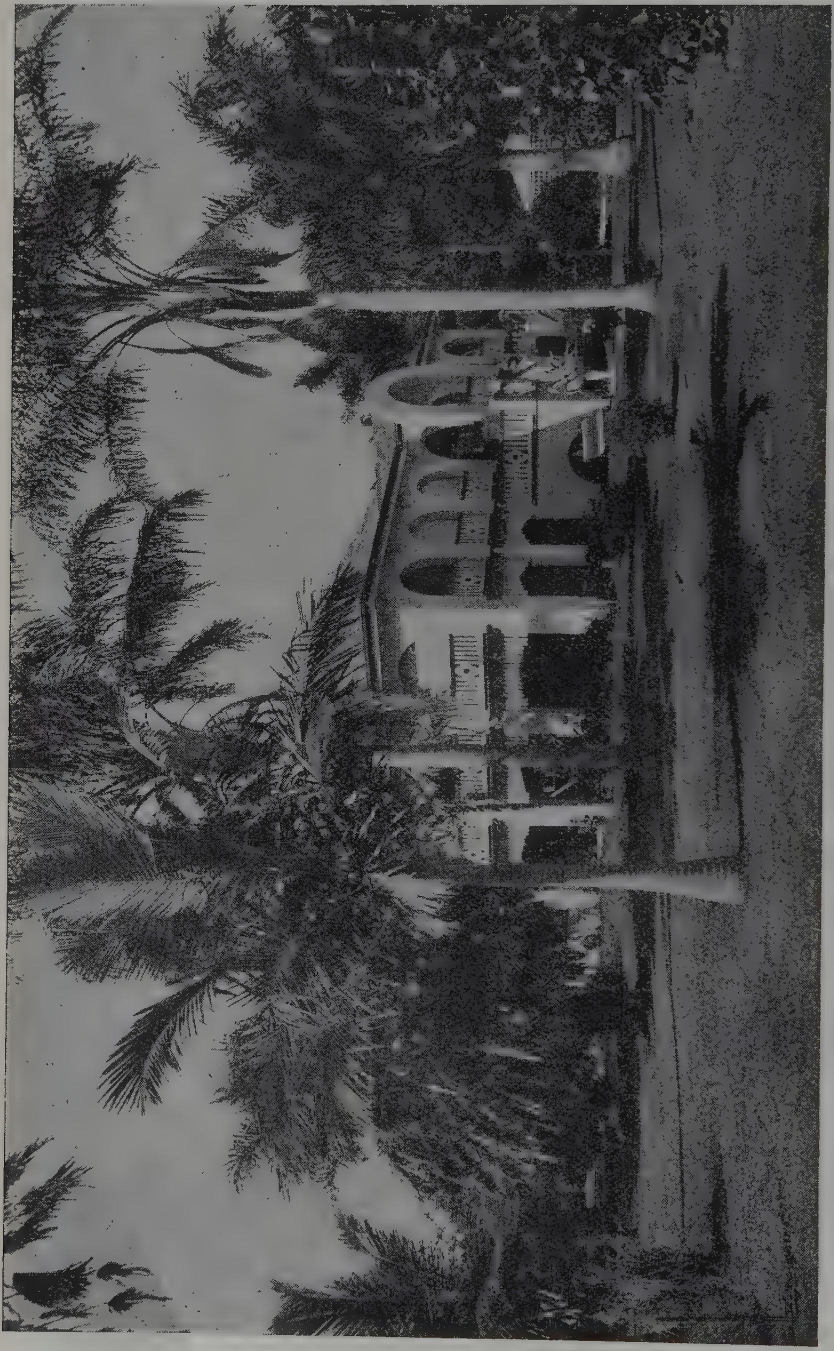


PLATE 27.
A Tropical Home and Garden, North Queensland.

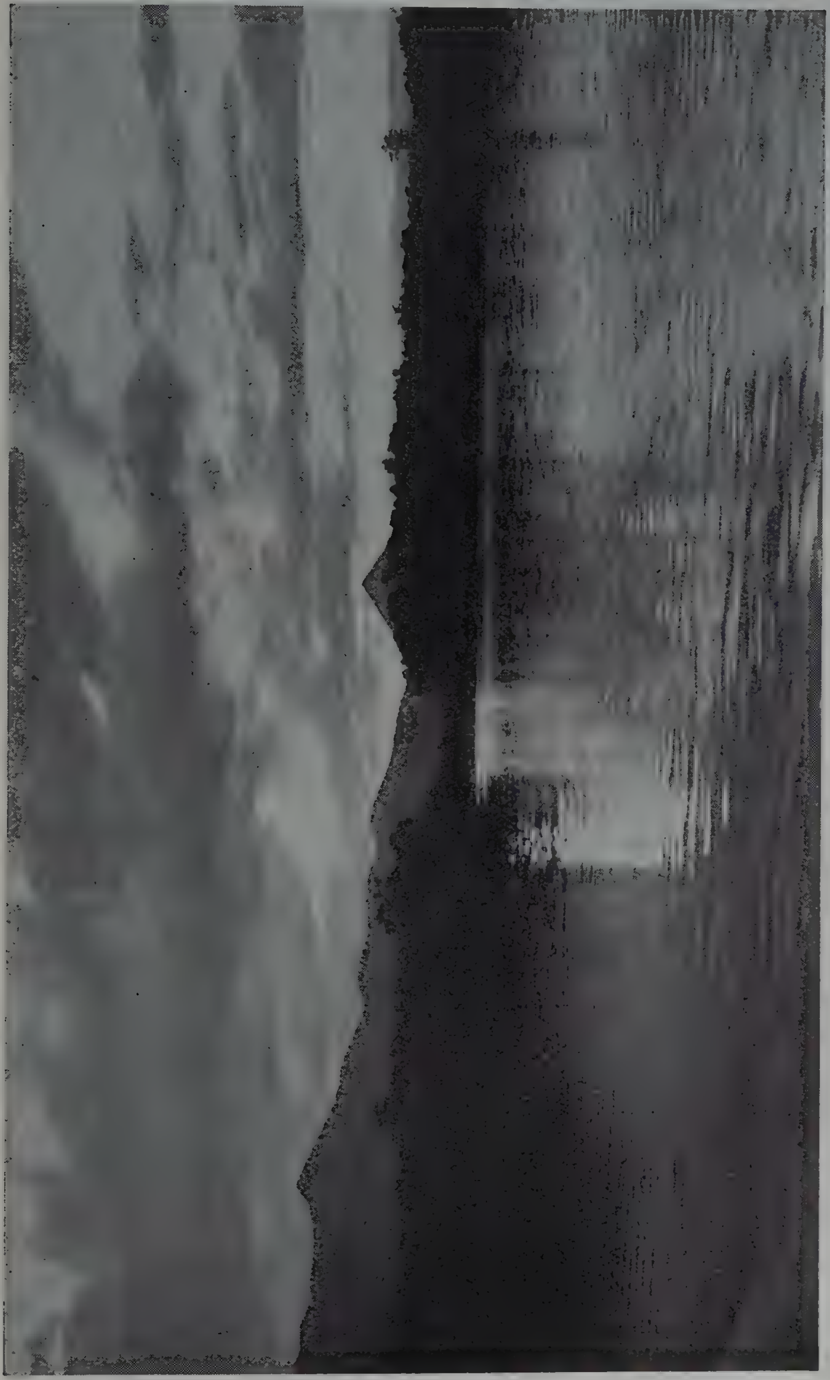


PLATE 28.
Sunset, Russell River, North Queensland.

THE HOME
and
THE GARDEN

OUR BABIES.

> *Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.*

OUR CHILDREN OF THE WEST.

FEW things are so helpful as friendly but candid criticism. A Western newspaper lately remarked that our monthly articles on the feeding of children, though doubtless containing sound advice, were of little use to those who could not obtain the diets recommended. In this criticism there is some truth. We write for the whole State, but are not ignorant that in the west of Queensland there are special difficulties in acting on our advice. Difficulties, we say, not impossibilities.

It is not easy for a coastal Queenslander to appreciate these difficulties, for he lives in a fertile comparatively well-watered area. He cannot visualise an apparently boundless plain, level to the horizon in all directions, very scantily clothed, if at all, with small stunted timber arising from soil more or less (mostly less) concealed by tufts of dry grass, though at rare intervals and for short periods buried in luxuriant grass and herbage. Here nothing is less certain than rain. At long intervals it falls heavily. When it will come no one knows, but one assertion may safely be made. Out of every four years on the average three will be dry years. What a dry year out West means very few coastal dwellers know. Indeed, most Queenslanders know more of Abyssinia than of two-thirds of their own State. They may complain of their own hot days tempered by sea breezes and followed by cooler nights. They cannot imagine furnace heats often from 110 to 115 degrees continued for weeks together and accompanied by dry winds that wither all the surface vegetation.

From this arid region comes most of our wool, the greatest wealth of our State; and in this region our women and children suffer the hardest conditions. What the eye has not seen, the heart does not feel; and of all parts of this State the children of the West are the most neglected. Except for a very brief annual visit by train our Child Welfare Service has not reached them. Branch Clinics have been promised for Longreach, Barcaldine, Blackall, and Aramac, and we hope they will soon be opened. Similar branches are equally needed in Roma, Chinchilla, Mitchell, Charleville, Cunnamulla, and Quilpie. Want of knowledge is the greatest drawback to the health of women and children everywhere, but in our West more knowledge is wanted than elsewhere. It is no simple problem to adapt our race to the difficulties of an arid climate.

Recently some interest has been aroused in our Western children. It is a hopeful sign. Summer coastal holidays for ill-nourished children from the inland plains have been tried here and elsewhere with wonderful results. At this Christmas season let us remember those who need a seaside change more sorely than we do ourselves.

IN THE FARM KITCHEN.

TRIFLES.

Banana Trifle.

Take 6 bananas, 1 lemon, 2 sponge-cakes, ½-pint milk, 1 egg, 1 teaspoon cornflour, 1 gill cream, a few glace cherries, 1 strip angelica, 2 oz. castor sugar.

Peel and slice five bananas with a stainless knife. Line a glass bowl with thin slices of sponge-cakes, and spread the banana on this. Squeeze over them the juice of a lemon, sprinkle with 1 oz. castor sugar, and leave for half an hour. Put the lemon rind in the milk, and let it warm gradually for half an hour. Then take out the rind. Mix the cornflour to a thin paste with a little cold milk. Bring the flavoured milk to the boil, pour it on the cornflour, return it to the pan with half an ounce of sugar, and stir while it boils for four minutes. Take it off the heat. and when it ceases boiling pour it on to the beaten egg. Leave until only just warm, then pour it over the bananas. Whip the cream with a dessertspoonful of castor sugar. Pile it on the custard when cold. Decorate with sliced bananas, cherries, and angelica. Serve when required.

Banana and Pineapple Trifle.

Take 5 small sponge-cakes, 2 bananas, 1 tin pineapple blocks, a little castor sugar, 1 lemon, ¼-pint cream.

Slice the sponge-cakes. Cut the bananas into rounds. Arrange them in alternate layers in a glass dish and squeeze the lemon juice over them. Empty the pineapple over all. Cover the dish and let the contents soak for one hour. Whip the cream lightly, add a few drops of vanilla essence, and pour over the trifle.

Pineapple Trifle.

Take 1 tin of pineapple, ½-pint packet pineapple jelly, 6 sponge fingers, ¼-pint cream, 1 teaspoonful castor sugar, 2 oz. glace pineapple, 6 drops pineapple essence. The pineapple should be whole or in slices.

Cut the pineapple into rings, then cut each ring in half. Put the sponge fingers in a glass dish and pour a gill of pineapple juice over it. Place the cut pineapple all round the sides of the glass dish, standing them up. Pour the pineapple jelly, made according to directions, gently in and leave until set. Whip the cream with the sugar and essence, chop the glace pineapple, toss it into the cream, pile it on in a rough mound, and serve.

Apricot Trifle.

Take 1 round sandwich cake, ¼-lb. dried apricots, 2 oz. apricot jam, 1 oz. almonds, 1 gill cream, 1 teaspoonful Noyeau syrup, 2 oz. castor sugar.

Well wash the apricots, put them into a bowl, rather more than cover them with warm water, and leave for twenty-four hours. Then drain off the water, put it in a stewpan with the sugar and boil quickly for three minutes. There should be half a pint of syrup. If there was not sufficient water from the apricots to make this, add water to make up the quantity. Put in the apricots and simmer until they are tender. Turn into a bowl to cool. Put the apricot jam in the sandwich and place it on a round dish. Drain off the syrup from the apricots, and when only just warm pour it over the sandwich. Leave for two hours. Blanch the almonds and slice them. Pile the apricots on the sandwich, mixing the almonds amongst them. Whip the cream until stiff, adding the Noyeau (if liked) and a little icing sugar. Put it into a forcing bag and decorate the top.

Apple and Nut Trifle

Take 1½ lb. apples, 2 oz. ground almonds, 2 oz. butter, 2 oz. sugar, 2 eggs, 1 gill cream, 2 oz. shelled walnuts.

Peel, core, and cut up the apples, put them in a saucepan with just enough water to prevent them burning (about two tablespoonfuls), and simmer until they are a soft pulp. Stir to prevent them sticking to the pan. Mash them with a fork and put them in a piedish. Beat the butter and sugar to a soft cream, add to it the ground almonds, well-beaten egg-yolks, and the whipped egg-whites. Pile this on the apple and bake in a slow oven for about three-quarters of an hour. When cool turn it out on a glass or fancy dish, and when quite cold whip the cream with a teaspoonful of castor sugar. Add to it the walnuts, skinned and chopped small. Pile on the trifle and serve.

Peach Trifle.

Take 4 ripe peaches (or a small tin of peaches), 2 oz. sugar, 1 small sponge sandwich, 2 oz. ratafias, ¼-pint cream, 2 glace apricots.

Skin, cut in half, and stone the peaches. Put the kernels into a saucepan with the sugar and a small teacupful of water. When the syrup boils, put in the peaches and simmer gently for ten minues. Turn into a bowl and set aside to cool. Cover the bottom of a glass dish with slices of sponge cake, put the ratafias on top, and pour over a quarter pint of peach syrup. Leave for one hour, then arrange the peaches. Whip the cream, pile it on, and decorate with the glace apricots cut in strips.

Meringue Trifle.

Take 6 pairs meringue cases, 3 sponge cakes, 2 tablespoonfuls jam, 1½ gills of cream, milk, sugar, vanilla essence, glace cherries, angelica.

Arrange the meringue cases in a dish in pairs to form a border. Whisk the cream until it stiffens, sweeten and flavour to taste. Split open the sponge cakes and then use them to fill up the centre of the ring, soaking each layer with a little milk (and rum if liked), and putting whipped cream between. Pile the remainder of the cream on top and decorate with two or three glace cherries and leaves of angelica.

Goblin Trifle.

Take some left-over rice pudding, custard, strawberry jam, ¼-pint cream, a few ratafias, hundreds and thousands. Allow 2 tablespoonfuls of rice pudding, 2 teaspoonfuls of jam, 1 gill custard, and 2 ratafias for each child.

Place a layer of jam in the bottom of a glass dish. Spread the rice pudding on top, then pour the custard over. When set cover with whipped cream and decorate with ratafias and hundreds and thousands.

Old-fashioned Trifle.

Take 1 pint cream, 1 pint custard, 6 sponge cakes, 1 dozen macaroons, ¼-lb. ratafias, strawberry jam, ½-pint sherry, ¼-pint brandy, ¼-pint water. The sponge cakes should be stale.

Mix the sherry, brandy, and water together. Spread a layer of jam on the bottom of a fancy glass dish. Cut the cakes in half, dip them into the wine and water, and put a layer of them on the jam. Then dip some macaroons and ratafias in the wine and put them with the layer of sponge cake. Pour some good thick custard over. Now add more jam-soaked cakes and custard, letting the cakes pile high in the centre. Whip and flavour the cream, put into a forcing bag, having a large rose pipe, and force this out on top of the cake mixture. The top of the cream can be ornamented with crystallised fruits, sweets, or anything that may be suitable and convenient. The trifle should be prepared some hours before it is to be served, and the cream is added at the last minute.

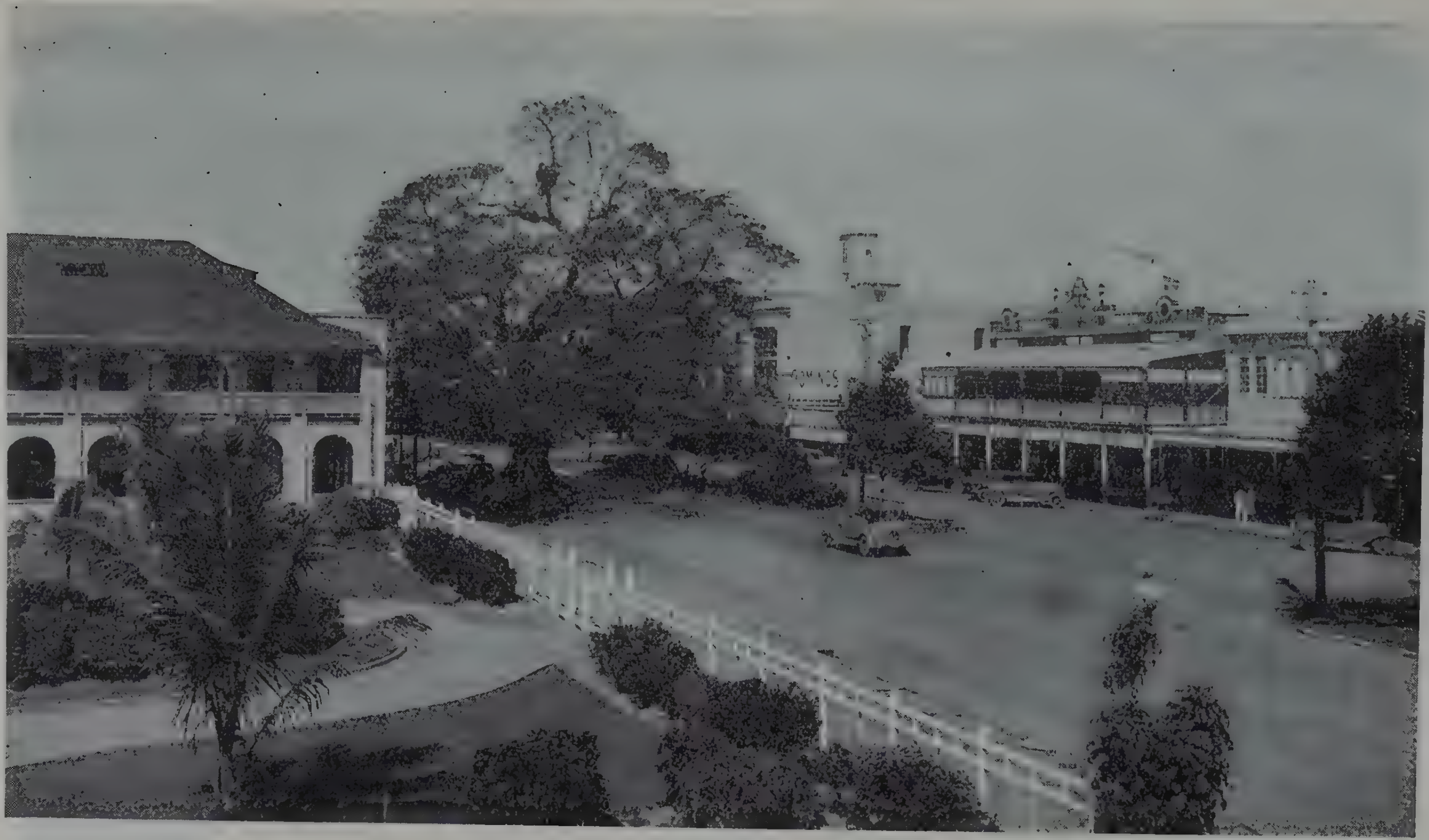


PLATE 29.
Abbott Street, Cairns, showing the "Tree of Knowledge."

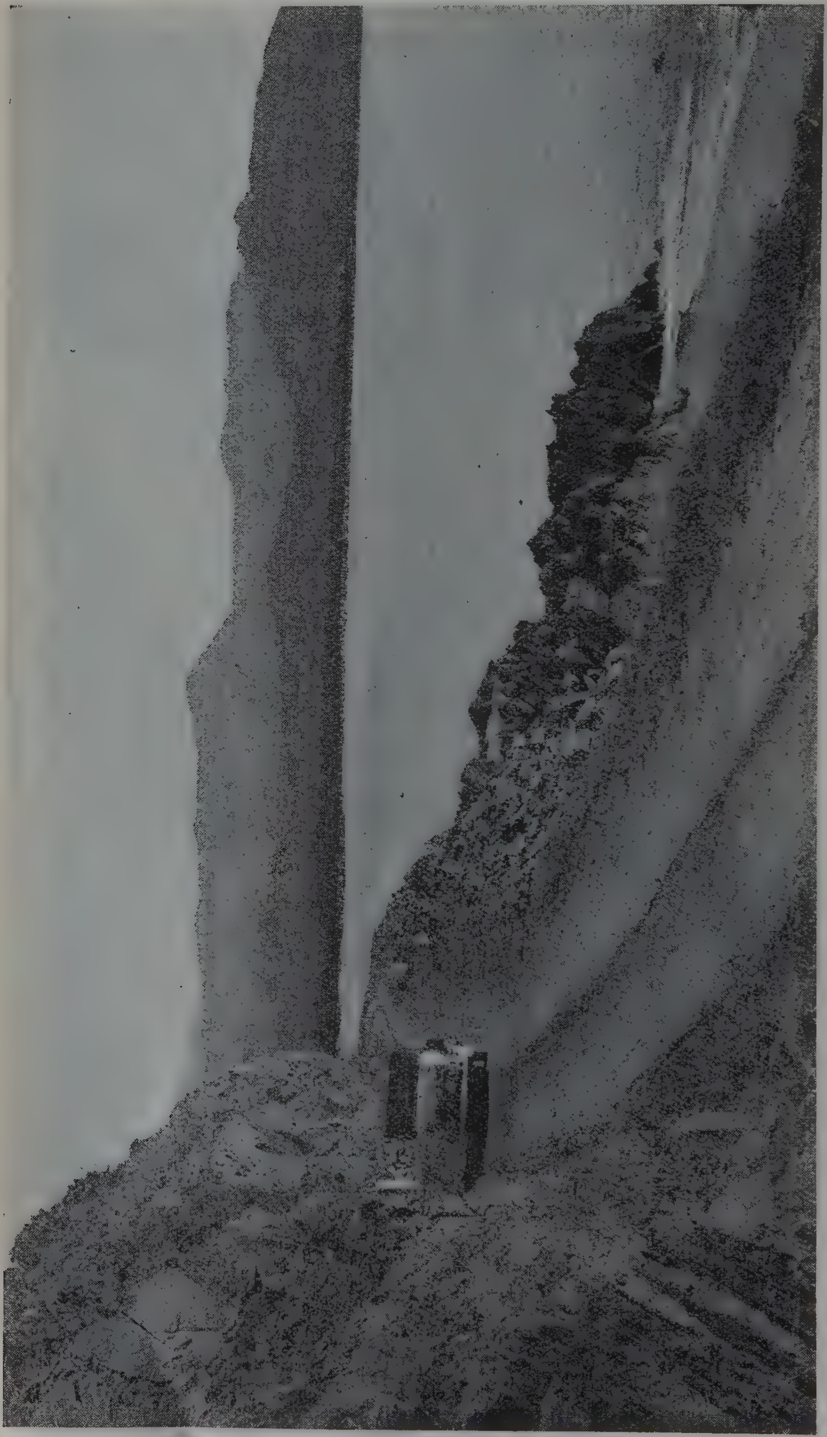


PLATE 30.

On the Cook Highway, Cairns to Port Douglas.

PLATE 31.

A HIGHWAY THROUGH THE JUNGLE.—On the Cairns Tableland Road, North Queensland.

PLATE 32.
The Barron River, North Queensland.

Orchard Notes for February.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkept, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become ''winey,'' while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4½ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well-filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rooted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is a slightest indication of danger, a further spraying will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broad-leaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed-bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and a similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane.

In most agricultural districts where two distinct planting seasons prevail, the :sent month is an excellent time for putting in potatoes. This crop responds to ›d treatment, and best results are obtainable on soils which have been previously ll prepared. The selection of good "seed" and its treatment against the possible :sence of spores of fungoid diseases is imperative. For this purpose a solution of ›int of formalin (40 per cent. strength) to 24 gallons of water should be made up, l the potatoes immersed for one hour immediately prior to planting the tubers. gs and containers of all kinds should also be treated, as an additional precaution. rish Blight" has wrought havoc at times in some districts, and can only be ‹cked by adopting preventive measures and spraying the crops soon after the nts appear above the ground. Full particulars on the preparation of suitable xtures for this purpose are obtainable on application to the Department of riculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing ıditions, should be kept in check amongst growing crops; otherwise yields are ely to be seriously discounted. The younger the weeds the easier they are to troy. Maize and other "hoed" crops will benefit by systematic cultivation. iere they are advanced, and the root system well developed, the cultivation should as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is ferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, l the thinning out of the plants to suitable distances to allow for unrestricted relopment. Turnips respond to the application of superphosphate; 2 cwt. per e is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good h in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas ring March, April, and May.

QUEENSLAND WHEATS.

In the current "Journal of the Australian Institute of Agricultural Science," . H. Wenholz, B.Sc., Agr., Director of Plant Breeding, Department of Agriculture, w South Wales, pays a graceful tribute to the work of Mr. R. E. Soutter, ricultural Research Officer (Wheat and Maize), Department of Agriculture and ck, Queensland, and formerly Manager of the Roma State Farm, in the following ns:—

Florence has been the leading variety of wheat in Queensland for many years, whereas it occupied 50 per cent. of the area in 1924, this proportion has dropped 16 per cent. in 1934. Pusa 4 and Clarendon have also been very popular wheats Queensland for some time, but the efforts of Mr. R. E. Soutter, working under at disabilities in breeding wheat at a State farm outside the main wheat belt, being slowly but surely rewarded. His three best varieties, viz., Three Seas C), Flora, and Cedric, evolved respectively in 1920, 1923, and 1925, occupied ween them in 1934 about one-third of the wheat area in Queensland, and nearly ther 10 per cent. is occupied by other wheats of his breeding such as Novo, by, Warchief, Duke of York, Watchman, &c. Soutter's chief objectives in eding wheats for the Queensland climate are early maturity, high grain quality, resistance to stem rust, combined with productiveness, and it is a tribute to capabilities that he has evolved three varieties which have these characters and ch have so largely taken the place of Florence, for this variety is itself so d in all the characters mentioned.

In Memoriam.

MR. EDMUND JARVIS.

By the death of Mr. Edmund Jarvis, of Boston street, Clayfield, which occurred on 18th December, Queensland loses one who made no mean contribution to the success of her sugar industry. For many years Mr. Jarvis carried out investigations in the entomological branch of that industry and published numerous bulletins, pamphlets, and articles on his discoveries. In this way he helped the cane farmers to fight the worst insect pests with which they have had to contend. For many years he was a regular contributor to this Journal.

The late Mr. Jarvis was a native of Devonshire, England, where he was born sixty-six years ago. Coming to Australia, he first settled in Victoria, but in 1908 he joined the Queensland Department of Agriculture and Stock as an assistant entomologist. In 1914 he was sent to Gordonvale, and took charge of the entomological laboratory of the Bureau of Sugar Experiment Stations there and upon the resignation of Dr. J. F. Illingworth in 1921 he was appointed to the charge of sugar-cane entomological work throughout the State. He was transferred to headquarters in Brisbane last year.

Mr. Jarvis was a great lover of nature, and was exceptionally gifted as an artist. In addition to his many notable illustrations in scientific papers, his love of nature found expression in the painting of many exquisite water colours. He had a particularly fine collection of paintings—his own work—of the variegated foliage of many varieties of acalypha and other flamboyant tropical plants. He was also an accomplished musician. His first scientific publication was "Notes on Insects Damaging Sugar-cane in Queensland" (1916), the finest comprehensive account of Queensland sugar-cane pests published up to that time. Other important publications included "Queensland Cane Insects and Their Control" (in three series), and "The Economy of Cockchafer Beetles."

The late Mr. Jarvis had a personality of great charm, a retiring nature, and a very friendly disposition marked by a constant unobtrusive desire to help others, particularly his fellow-officers. Mr. Hubert Jarvis, a well-known entomologist and artist, is a brother.

Deep sympathy is extended to the widow of the late Mr. Jarvis and their family of four children, and to other bereaved relatives, in their great sorrow.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Nov.	No. of Years' Records.	Nov., 1935.	Nov., 1934.
North Coast.	In.		In.	In.
Atherton	2·46	34	1·25	8·42
Cairns	3·97	53	2·91	5·12
Cardwell	4·19	63	4·35	8·46
Cooktown	2·57	59	0·38	3·38
Herberton	2·64	49	1·80	6·26
Ingham	3·94	43	1·04	5·81
Innisfail	6·36	54	4·64	4·92
Mossman Mill ..	4·37	22	3·88	5·48
Townsville	1·91	64	0·37	3·06
Central Coast.				
Ayr	1·81	48	0·16	6·70
Bowen	1·31	64	0·37	2·13
Charters Towers ..	1·47	53	0·04	1·23
Mackay	3·16	64	0·81	3·38
Proserpine	3·01	32	0·81	6·05
St. Lawrence ..	2·46	64	0·15	8·86
South Coast.				
Biggenden	2·89	36	..	5·76
Bundaberg	2·75	52	0·15	13 93
Brisbane	3·77	84	1·26	5·68
Caboolture	3·59	48	0·48	8·25
Childers	2·86	40	..	5·78
Crohamhurst	4·61	42	1·76	7·97
Esk	3·30	48	1·61	4·05
Gayndah	3·02	64	0·05	7·32
Gympie	3·30	65	0·18	7·73
Kilkivan	2·63	56	0·10	5·04
Maryborough ..	3·26	64	1·52	5·77
Nambour	4·14	39	0·95	7·42
Nanango	2·80	53	0·16	7·50
Rockhampton ..	2·47	64	0·07	7·02
Woodford	3·34	48	0·71	7·29
Central Highlands.	In.		In.	In.
Clermont	2·07	64	..	2·20
Gindie	2·23	36	..	7·57
Springsure	2·23	66	0·05	6·17
Darling Downs.				
Dalby	2·82	65	0·58	5·46
Emu Vale	2·77	39	0·26	2·55
Hermitage	2·71	29	0·09	1·74
Jimbour	2·64	47	0·20	7·11
Miles	2·67	50	0·37	4·86
Stanthorpe	2·76	62	0·70	2·52
Toowoomba ..	3·38	63	0·39	3·65
Warwick	2·66	70	0·17	2·25
Maranoa.				
Roma	2·22	61	0·56	7·40
State Farms, &c.				
Bungeworgorai ..	2·53	21	..	8·39
Gatton College ..	3·03	36	0·31	2·83
Kairi	2·42	21	..	4·91
Mackay Sugar Experiment Station	2·91	38	0·79	3·81

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—NOVEMBER, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure. at 9 a.m.	SHADE TEMPERATURE.						RAINFALL.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·88	88	72	96	17	67	5	38	5
Herberton	..	81	60	93	15	51	4, 13, 14	180	10
Rockhampton	30·00	90	67	104	15	62	11	7	1
Brisbane	30·04	81	63	98	14	57	1	126	5
Darling Downs.									
Dalby	29·99	88	59	97	21	47	18	58	4
Stanthorpe	..	80	52	92	21	38	18	70	3
Toowoomba	..	81	55	92	21	47	18	39	3
Mid-Interior.									
Georgetown	29·87	99	72	103	1, 4, 5, 14, 15	63	10	44	1
Longreach	29·92	97	66	104	13, 21	55	7	10	3
Mitchell	29·97	91	61	101	21	47	18	87	4
Western									
Burketown	29·85	95	75	103	14, 19	64	18, 19	62	2
Boulia	29·86	101	70	110	20	50	17	62	2
Thargomindah	29·92	93	67	109	20	56	17, 18	8	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1936.		February. 1936.		MOONRISE. Jan., 1936.	MOONRISE. Feb. 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	p.m.
1	5·0	6·50	5·25	6·47	11·24	1·34
					p.m.	
2	5·1	6·50	5·25	6·47	12·27	2·34
3	5·1	6·50	5·26	6·46	1·31	3·33
4	5·2	6·51	5·26	6·45	2·33	4·25
5	5·2	6·51	5·27	6·45	3·37	5·10
6	5·3	6·51	5·28	6·44	4·40	5·51
7	5·3	6·51	5·28	6·44	5·38	6·27
8	5·4	6·52	5·29	6·43	6·29	6·59
9	5·5	6·52	5·30	6·42	7·23	7·28
10	5·6	6·52	5·31	6·42	7·53	7·58
11	5·7	6·52	5·32	6·41	8·27	8·27
12	5·7	6·52	5·32	6·40	9·0	8·58
13	5·8	6·52	5·33	6·39	9·31	9·30
14	5·9	6·51	5·34	6·38	9·59	10·8
15	5·10	6·51	5·35	6·37	10·30	10·47
16	5·11	6·51	5·36	6·36	11·0	11·35
17	5·11	6·51	5·36	6·36	11·34	
						a.m.
18	5·12	6·51	5·37	6·35	a.m.	12·27
19	5·13	6·51	5·38	6·34	12·10	1·25
20	5·14	6·50	5·38	6·33	12·55	2·27
21	5·15	6·50	5·39	6·32	1·46	3·34
22	5·16	6·50	5·40	6·31	2·42	4·41
23	5·17	6·50	5·40	6·30	3·43	5·50
24	5·18	6·50	5·41	6·29	4·48	6·56
25	5·18	6·49	5·42	6·28	5·59	8·3
26	5·19	6·49	5·43	6·27	7·2	9·10
27	5·20	6·49	5·43	6·26	8·10	10·18
28	5·21	6·49	5·44	6·25	9·13	11·24
						p.m.
29	5·21	6·48	5·45	6·24	10·19	12·28
30	5·22	6·48			11·23	
31	5·23	6·48			12·29	

Phases of the Moon, Occultations, &c.

2 Jan.,	☾ First Quarter	9 12 a.m.
9 ,,	○ Full Moon	12 42 a.m.
17 ,,	☽ Last Quarter	10 36 a.m.
24 ,,	● New Moon	12 36 p.m.
31 ,,	First Quarter	9 36 a m.

Apogee, 15th January, at 9.48 a.m.
Perigee, 26th January, at 3.30 a.m.

On the 4th the Earth will arrive at that part of its orbit which brings it nearest to the Sun; it will then be 3,120,000 miles nearer than on 4th July. It might be expected that our hottest day would be when the Sun is nearest, but meteorologists are aware of many other conditions which affect the temperature, and know that it is impossible to foretell a month beforehand what the temperature will be.

There will be a total eclipse of the Moon in the early hours of the 9th. The Moom will enter the Umbra, or darker part of the Earth's shadow, at 2.28 a.m. It will be in the deepest part at 4.9, and will not emerge till 5.51, three-quarters of an hour after Sunrise. The phases of the Moon will show that it will be rather less than halfway between Perigee and Apogee. The previous Perigee having been on 31st December, it will traverse the Earth's shadow where it is more than the average width. Between the time of entering the Umbra and leaving will be 3 hours 23 minutes.

On the 16th Venus and Jupiter will be apparently within a degree and a half of one another, between Scorpio and Sagittarius. They will be about 3 hours before the Sun and nearly due north-east at sunrise, being best seen about an hour and a half earlier, when nearer the eastern horizon.

On the 16th Mercury in Capricornus, will be at its greatest elongation, 19 degrees east of the Sun, and will not set till one hour eight minutes after it.

Observers who notice the Moon and Jupiter in the early hours of the 21st will see the planet about 4 degrees (eight times diameter of Moon) to the north-eastward. On the following morning Jupiter will appear to be 12 degrees (twice length of Cross) west of the Moon.

On the 26th, Mars and Saturn, though in orbits 745 millions of miles apart, will appear to be within one degree of one another. They will be visible on the western horizon an hour after sunset wherever that part of the sky is clear.

7 Feb.	○ Full Moon	9 19 p.m.
16 ,,	☽ Last Quarter	1 45 a.m.
23 ,,	● New Moon	4 42 a.m.
29 ,,	☾ First Quarter	7 28 p.m.

Apogee, 12th February, at 4.6 a.m.
Perigee, 24th February, at 8.24 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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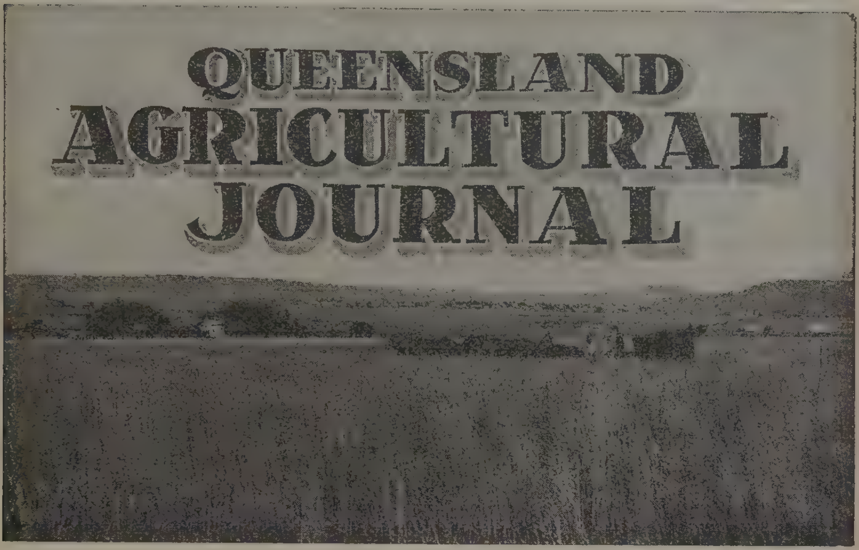
QUEENSLAND AGRICULTURAL JOURNAL



VOL. XLV. 1 FEBRUARY, 1936. PART 2

Event and Comment.

Death of the King.

THROUGHOUT Australia, no less than in the Motherland, the death of King George V. aroused a feeling of profound sorrow, to which was added a sense of deep personal loss. Of the late King's own consciousness of the greatness of the trust he held as head of the most liberal democracy in the world, his Empire has had the amplest evidence. It has been said of the Empire that it has become a fellowship of self-governing peoples; yet their freedom has not lessened, but strengthened their loyalty to the one Commonwealth. "It is in the one Throne that they find the symbol and bond of their unity."

The Archbishop of Canterbury expressed the sentiments of the whole of the British Dominions when he said that it might be that by mere force of circumstances or sentiment the Throne itself would have been accepted by the people of the United Kingdom, and the nations of the Empire, as the centre of their unity. What was certain was that the personality of the King had given to the Throne the power of personal attachment. He brought the Throne into the hearts of his subjects. They had discovered in the Sovereign a man whom they could understand, respect, and trust. They had seen him in quiet dignity worthy of his high office, and with it an unaffected friendliness. They had seen his constant care for their welfare, and his unselfish devotion in their service.

The sentiments of Queenslanders have been expressed eloquently, yet simply, by Archbishop Wand and Archbishop Duhig of Brisbane.

In the course of his address at the Citizens' Memorial Service in Brisbane, Archbishop Wand said that King George had not only endeared himself to the people of this country by visiting Australia and identifying himself with its interests, but he presided over the development of the Dominions into adult nationhood. To-day the Crown is recognised as the symbol of that allegiance which binds us, a free and independent people, into the great Commonwealth of the British Empire.

"Therefore we rejoice in the memory of his kingly acts. With pride we remember how once and again, when the machinery of government seemed on the point of breaking down, he was able by his own personal interposition to set the wheels again in motion and save the greater part of the civilised world from disaster. With humble gratitude we recall how in the day of the nation's greatest peril his sense of Royal duty led him to share the sacrifices and dangers of his people even to the point when, like any of his sick or wounded soldiers, he was carried by ambulance from the scene of war. Above all, we exult that by his steadfast example he led us through a quarter of a century of unexampled difficulty until he brought us to a condition of recovery and stability which is the envy of all nations.

"But . . . our reverence for the King is merged in our admiration for the man. The unique and central position of the British Throne demands that for the security of the Empire the Crown shall be worn by one whose personality draws forth the best in his subjects. Of King George V. it may be said that he displayed a character which 'became the enthroned monarch better than his crown.'

"His dignity sprang from an unfeigned simplicity that endeared him to the heart of his people. Like many sailors he combined a love of the sea with a longing for the homely interests of the countryside. His farm, his horses, and his cattle were the delight of his private life. It was in the pastoral surroundings of his country home at Sandringham that he wished to die. The desire was fulfilled. Among the quiet scenes and the friendly folk with whom he was most familiar he entered into his rest.

'Here he lies where he longed to be,
Home is the sailor, home from sea,
And the hunter home from the hill.'

"He was extraordinarily modest about his own abilities. Yet it was to the advantage of the whole Empire that the sea and the country had impressed characteristic qualities upon the personality of the great monarch. Clear vision and kindly courtesy, sense of duty, and willingness to serve were the gifts most needed in his day and station. These he displayed with a devotion that has rarely been equalled and never surpassed by a reigning king. He raised our common nature to the pitch of genius, and revealed in the capacities of the plain man an inexhaustible treasure for the service of humanity."

In the course of his panegyric preached in St. Stephen's Cathedral, on the day of the funeral of King George V., Archbishop Duhig said:—

"For a quarter of a century King George ruled through recurring periods of exceptional difficulty. He saw thrones rock and fall, while out of each ordeal came his own set more firmly in the hearts of the people whom he trusted absolutely and whose liberties he never sought to curtail. It was said by the poet Claudian that 'never could liberty shine more fair than under a righteous king.' Of the truth of this assertion we have ample proof in the reign of the beloved monarch who is to-day being laid to rest to the accompaniment of the tears and prayers of his people.

"Seldom if ever has the news of the demise of a monarch evoked anything like the widespread sorrow that . . . marked the announcement of the King's death. Not only the people of a vast Empire, but men and women of every race and nation beyond its confines, joined in mourning the loss of a beloved friend of humanity. The world seemed to pause in its daily routine as if numbed by the sudden removal from its councils of a mighty influence for stability, peace and goodwill. Men and women in every condition of society from the factory worker to the millionaire, uncovered and bowed their heads in silence at the passing hence of one who was not only a great King but a truly good man, the warm rays of whose kindly thoughts and deeds penetrated everywhere and the common passport to whose sympathy was suffering and want.

"Unprecedently great as were the Throne and Empire to which he succeeded, George V. never allowed himself to be carried forward automatically by their motion or live on their influence. He never sank the beauty and power of a fine personality in the role or title of a King. He was before all else a man and one so good that the qualities of the man often overshadowed the dignity of the King, and leaving undiminished the ancient respect of the people for the Crown, translated their obedience into a passionate personal attachment for him who wore it. To him might with truth be applied the poetic words written of one of his predecessors of over 200 years ago!

> 'While the late King had many other gifts befitting a ruler, he will always be best remembered for his Christian attitude to every phase of national and social life, his devotion to duty, and his solicitude for the welfare of his people in every portion of his Dominions. He sought the good of his people and his power and his glory pleased them well all his days.'

"The King was almost as well known overseas as he was at home. As a Prince he had made two visits to this country. As King he had met many Australian visitors in London, and tens of thousands of the people of the Commonwealth had heard his voice in his touching Christmas messages over the radio.

"Above all he had taken a keen personal interest in this country, which he had himself launched on its career as a free Commonwealth and whose growth and progress he had ever since watched with pride. It is because of all these considerations that Australians can heartily enter into the sentiments expressed by the English poet who wrote:—

"We, too, are friends to loyalty.
We love
The king who loves the law,
respects his bounds,
And reigns content within them.
Him we serve
Freely and with delight, who leaves us free.

"The King's life has added lustre to his throne and has elevated monarchial rule in the eyes of the whole world. His memory will be enshrined in the hearts of the people and his name will live in history as one of the most beloved of British rulers.

"With this sincere tribute to the late King I feel we must combine words of admiration for the bereaved Queen who so loyally and faithfully shared his joys and sorrows, and his work and solicitude for the people. Queen Mary is undoubtedly one of the great women of our time, and history we hope will record how far-reaching has been her influence for good on the life of the nation. . . .

"As to the new King, we may say of him in the words of Holy Writ: 'His father is dead, and he is as if he were not dead; for he hath left one behind him that is like unto himself.' (Eccli., 30th chapter, fourth verse). That is the highest tribute we can pay to the new Sovereign, and we can pay it in all truth and sincerity. The loss sustained by the death of the late King is felt intensely everywhere, but happy without doubt is the nation that can suffer so great a loss and can see it so readily repaired by the accession to the Throne of a son whose extensive travels abroad in the Dominions and in foreign lands as the best Ambassador of his Empire has prepared him to rule it wisely and whose first declaration to his people was that he would walk in the footsteps of his beloved father. May his reign be lengthy and peaceful, blessed by God and beneficial to all the people. . . .

"May God reward the love of justice, charity, and kindly compassion which marked the life of the noble dead, and may Divine Providence guide and protect him upon whose shoulders has fallen the mantle and responsibilities of his kingly father.

"In the name of all I say in the ancient Latin tongue: Vale Optime Rex: sit tua perennis Memoria: Adieu O Excellent King: may thy memory never fade."

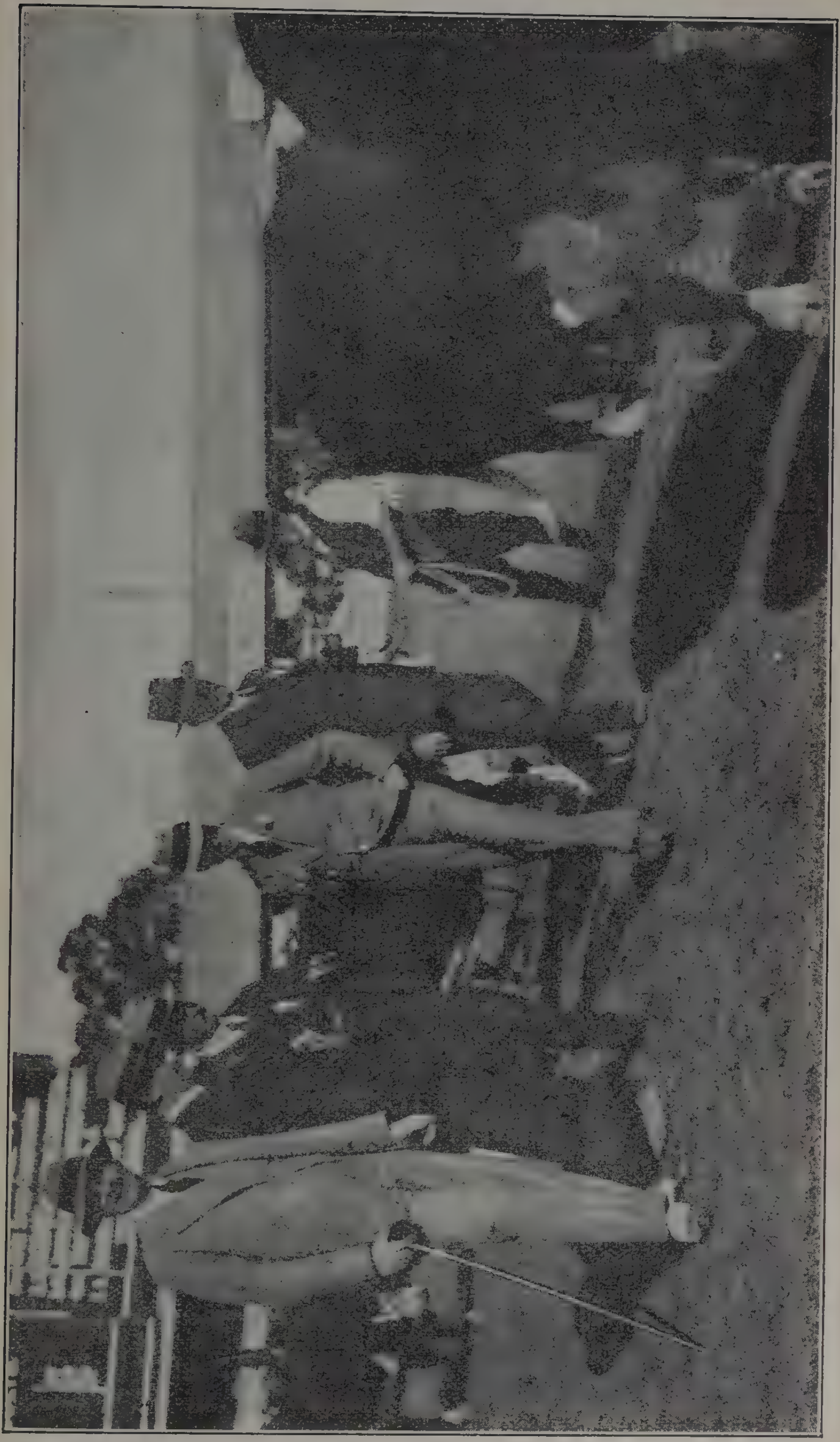


PLATE 35.

HIS MAJESTY KING EDWARD VIII. interested in the Herefords at the Royal Show, Brisbane, 1920.

Cat. M.L.

Red Shouldered Leaf Beetle.*

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

THE red shouldered leaf beetle attacks a wide range of economic plants, but occurs thereon only at infrequent intervals and is accordingly regarded as being normally a minor pest. It has been recorded as attacking apple, avocado, banana, citrus, cotton, dahlia, fig, grape vine, loquat, maize, mango, mulberry, peach, pepper, plum, quince, rose and wattle. Practically any part of the above ground portion of the host plant may be attacked, e.g., in the case of cotton (Plate 36; figs. 1 and 2) the foliage, flowers, squares, bolls and bark may all suffer from the infestation. Feeding may take place on either surface of the foliage which may be perforated by the beetles or have only one or both surfaces eroded without perforation. The leaves usually manifest both types of damage and thus present a ragged perforated and withered appearance. When fruits such as those of the fig, apple, quince, and loquat are attacked, extensive areas of the skin may be eaten (Plate 36; fig. 3) and the underlying pulp is frequently gouged out. Although this beetle is normally of little importance it can be extremely destructive when it occurs in plague proportions, trees and other plants sometimes being denuded of foliage, flowers, and fruit in a few days. It was abnormally abundant in 1923, cotton being one of the heaviest sufferers during that outbreak. Since then it has been recorded at intervals as being destructive to various host plants, and during recent weeks it has been observed attacking cotton, fruit trees, and ornamental plants.

Life History and Habits.

This pretty little beetle measures slightly less than a quarter of an inch in length, its breadth being somewhat greater than half its length, the general impression conveyed being that of a squarish sturdily built insect. The body colour is light yellow, but there is a distinct cherry coloured band stretching across the back of the body at the base of the wing covers, and a pair of similarly coloured circular spots occurs on the back towards the end of the body. Little is known of the life history of this pest, which appears suddenly in enormous numbers, a single leaf of an infested plant not infrequently affording harbourage for fifty or sixty of the active little beetles. The duration of infestation of a crop is generally relatively brief, but, as already indicated, losses in that brief period may be serious.

Control.

A procedure frequently adopted for the control of this pest is based on the fact that it is attracted to light when disturbed at night, and flares are accordingly used for its destruction. A suitable flare is produced by securely wrapping some old sacking or similar material round a seven or eight foot pole, dipping it in kerosene and then lighting it. This flare is carried between the trees or among the plants known to be infested and if these trees or plants are jarred it will be found that large numbers of beetles will fly into the flare and will thus be destroyed. The sacking and kerosene must be renewed as required and the flare should be kept as bright as is consistent with the safety of the person carrying it. The jarring of the food plants must be adequately attended

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* *Monolepta rosea* Blkb.

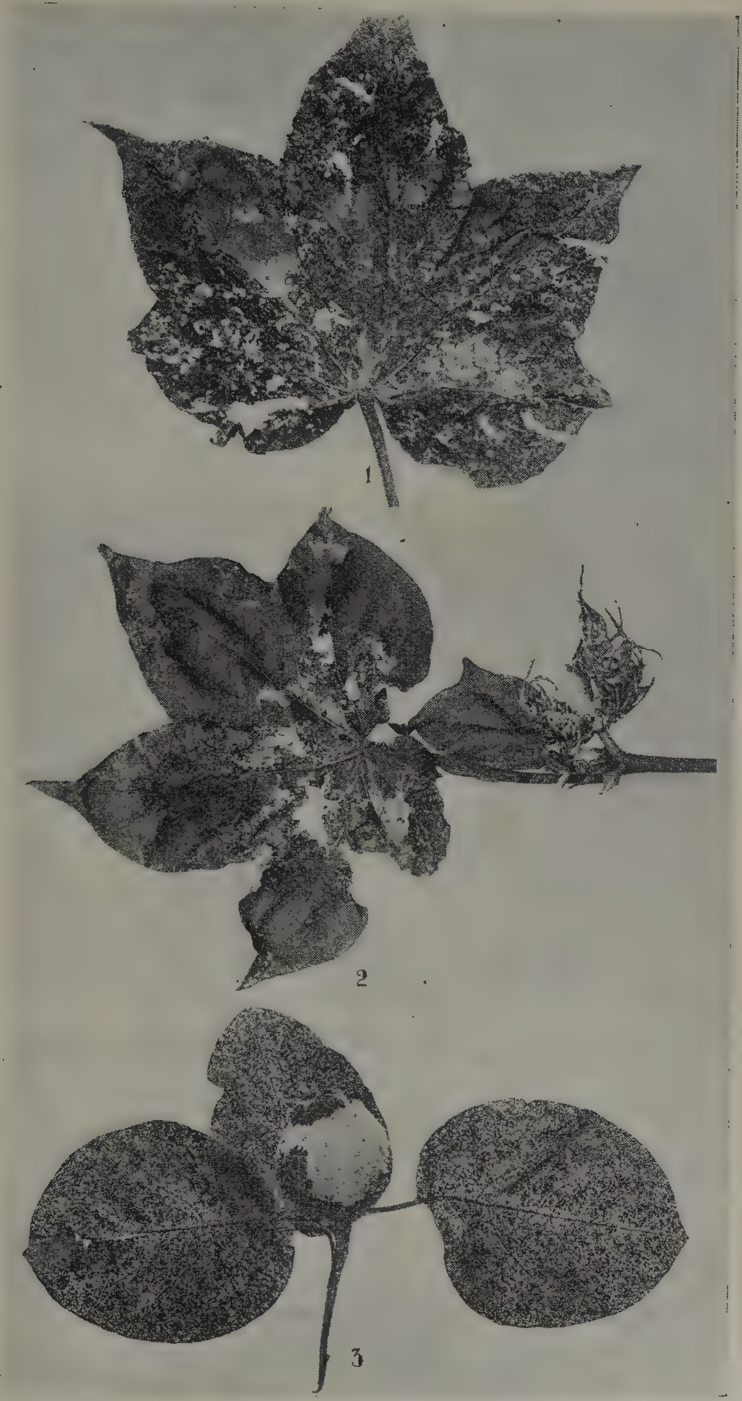


Plate 36.—Red Shouldered Leaf Beetle.

Fig. 1.—Attacked cotton leaf; Fig. 2.—Attacked fruiting branch of cotton plant; Fig. 3.—Attacked quince fruit and foliage.

to in order to obtain the best results from this control measure. It is also worth while to make an inspection before dusk in order to note where the heaviest concentrations of the beetle occur so that the operator's efforts may be centred where the beetle population is greatest.

Spraying infested trees or other host plants with arsenate of lead or dusting them with a reliable brand of arsenate of lead dust will be found to be productive of some good in cases where arsenicals can be used with safety. The beetles, however, are frequently present in such enormous numbers that a great amount of foliage and other plant tissue is consumed before they have obtained a lethal dose of the spray or dust. Hence there is much to be said in favour of attempting control by the use of flares.

◆

QUEENSLAND SHOW DATES.

January.

Pittsworth Bushmen's Carnival, 27.

February.

Stanthorpe, 5 to 7.
Killarney, 13 and 14.
Clifton, 19 and 20.

March.

Allora, 3 and 4.
Milmerran, 6.
Oakey, 7.
Pittsworth, 11 and 12.
Goombungee, 13.
Warwick, 18 to 20.
Tara, 18; Campdraft, 19.
Toowoomba, 23 to 26.

April.

Crow's Nest, 1 and 2.
Dalby, 1 and 2.
Chinchilla, 7 and 8.
Miles, 22.
Kingaroy, 22 to 24.
Wallumbilla, 28 and 29.
Wondai, 30 April and 1 May.

May.

Goondiwindi, 1 and 2.
Taroom, 4 to 6.
Beaudesert, 6 and 7; Campdraft, 8 and 9.
Charleville, 5 to 7.
Murgon, 7 to 9.
Goomeri, 13 and 14.
Mitchell, 13 and 14.
Ipswich, 19 to 22.
Roma, 19 to 21.
Biggenden, 21 and 22.
Warrill View, 23.
Maryborough, 26 to 28.
Toogoolawah, 29 and 30.
Kalbar, 30.

June.

Bundaberg, 4 to 6.
Lowood, 5 and 6.
Boonah, 10 and 11.
Esk, 12 and 13.
Rockhampton, 23 to 27.
Laidley, 24 and 25.
Mackay, 30 June and 1 July.

July.

Cleveland, 10 and 11.
Rosewood, 10 and 11.
Nambour, 16 to 18.
Caboolture, 31 July and 1 August.

August.

Royal National, 17 to 22.
Tully, 11 and 12.
Innisfail, 18 and 19.

Leaf Miner and Stem Borer of Tobacco in North Queensland.

By D. O. ATHERTON, B.Sc.Agr., Assistant Entomologist.

(*Continued from January*, 1936.)

THE STEM BORER.

As far as can be ascertained from "The Review of Applied Entomology," the stem borer, *Phthorimaea heliopa* Low., has not been recorded as a pest of any cultivated crop other than tobacco, though known as a serious pest of the latter crop for more than twenty years. There are early records of severe losses traced to the stem borer in both Indo-Malayan and African tobacco growing districts (Jack, 1913). Since then the pest has been reported from a number of the important tobacco growing countries of the world, but not from America. The present distribution includes the following countries:—Rhodesia, Nyasaland, Tanganyika, Greece, Turkey, Palestine, India, Ceylon, Malaya, the Phillipines, East Indies, Australia, Fiji, and Samoa.

The insect was not recorded as a pest of tobacco in Australia until recently (Smith, 1932), though it was originally described from New South Wales in 1900. It certainly has been present in the Australian tobacco crops for many years, as unpublished illustrations in the Queensland Department of Agriculture and Stock show that the pest occurred in tobacco at Bowen in the year 1909. There is apparently no specific record of any wild host for this pest in other countries. In North Queensland during this investigation the species has been taken in two wild tobaccos, *Nicotiana suaveolens* and *N. glauca*. The former is indigenous in Queensland and the latter is a naturalised introduction from South America.

It is significant that whilst no records of this species are from the American continent, the original home of the cultivated tobacco, it has been recorded from tobacco in many of the countries bordering the Indian Ocean. Thus it seems that the insect is indigenous in these countries about the Indian Ocean and that *Nicotiana tabacum* is not the primary host. The species has been regarded as a major pest of tobacco in several countries for more than two decades and yet, in spite of protracted investigations (Keuchenius, 1915), there is in the literature no specific record of any native host. In short, the natural occurrence of the insect now known as the tobacco stem borer presents a very interesting problem which may well repay further study.

Description.

Adults of this species (Plate 37; fig. 8) exhibit considerable variation in size, but the average length is little more than 6.5 mm. and the width across the outspread wings may be slightly greater than 13 mm. The moths are coppery-red or reddish-brown in colour and the forewings are mottled with small darker patches. When at rest the forewings are held folded roofwise over the back, the tips overlapping a little. The apical margins of the forewings are fringed with light brown hairs, very short at the apex and increasing slightly in length to the anal angle. The hind wings are greyish in colour and the margins from the apex round the anal angle to the thorax are fringed with relatively long grey hairs. In the female the abdomen is stouter than in the male and the tip of the female abdomen has the appearance of a tiny crater, whereas in the male the tapering of the abdomen is less pronounced and it ends in a bluntly rounded tip.

The species was originally described as follows:—

Gelechia heliopa n. sp.

8–11 mm. Head, thorax, palpi and antennae ochreous, fuscous tinged, second joint of palpi grooved. Antennae faintly annulated with fuscous. Abdomen greyish-ochreous, middle segments orange-yellow, segmental margins silvery white. Legs whitish, tibiae and tarsi fuscous, tarsi with whitish rings. Fore-wings elongate, moderate, costa gently arched, apex round-pointed; ochreous slightly fuscous tinged, with darker irregular spots throughout, obscure and sometimes hardly traceable, not forming definite markings; cilia ochreous. Hindwings with apex pointed, hind-margin sinuate beneath apex; light fuscous; cilia light fuscous, with an ochreous basal line.

Broken Hill, New South Wales; four specimens in October (Lower, 1900).

Life History.

The various stages in the life history of this pest are described in these notes along the same lines as those adopted in the discussion of the leaf miner.

Egg.

The eggs (Plate 37; fig. 1) of the stem borer are creamy white in colour when newly laid and are somewhat elongate oval in outline, being shaped rather like a short cylinder terminated at each end by a hemisphere. The mean length of one series of egg measurements was $479 \pm 23\,\mu$ and the mean width $315 \pm 13\,\mu$. The chorion is fairly smooth, but somewhat pronounced slightly irregular polygonal reticulations are present on the whole of its surface.

The darkening of the developing fertile egg caused by the formation of colouring matter in the head capsule and prothoracic plate of the embryo, and the processes involved in the hatching of the larva from the egg, are all as discussed in the case of the leaf miner.

Temperature has a marked influence on the duration of the egg stage if this factor alone is responsible for the difference between the length of the incubation period of eggs laid in the winter and those laid in summer. Early in August in Cairns the egg stage was invariably either nine or ten days, but by the end of the month it had shortened to six days, while during October, November, and December, the egg stage usually lasted only four days (Table 5). Thus in Cairns the duration of the egg stage varies from as much as ten days in winter to four days in summer.

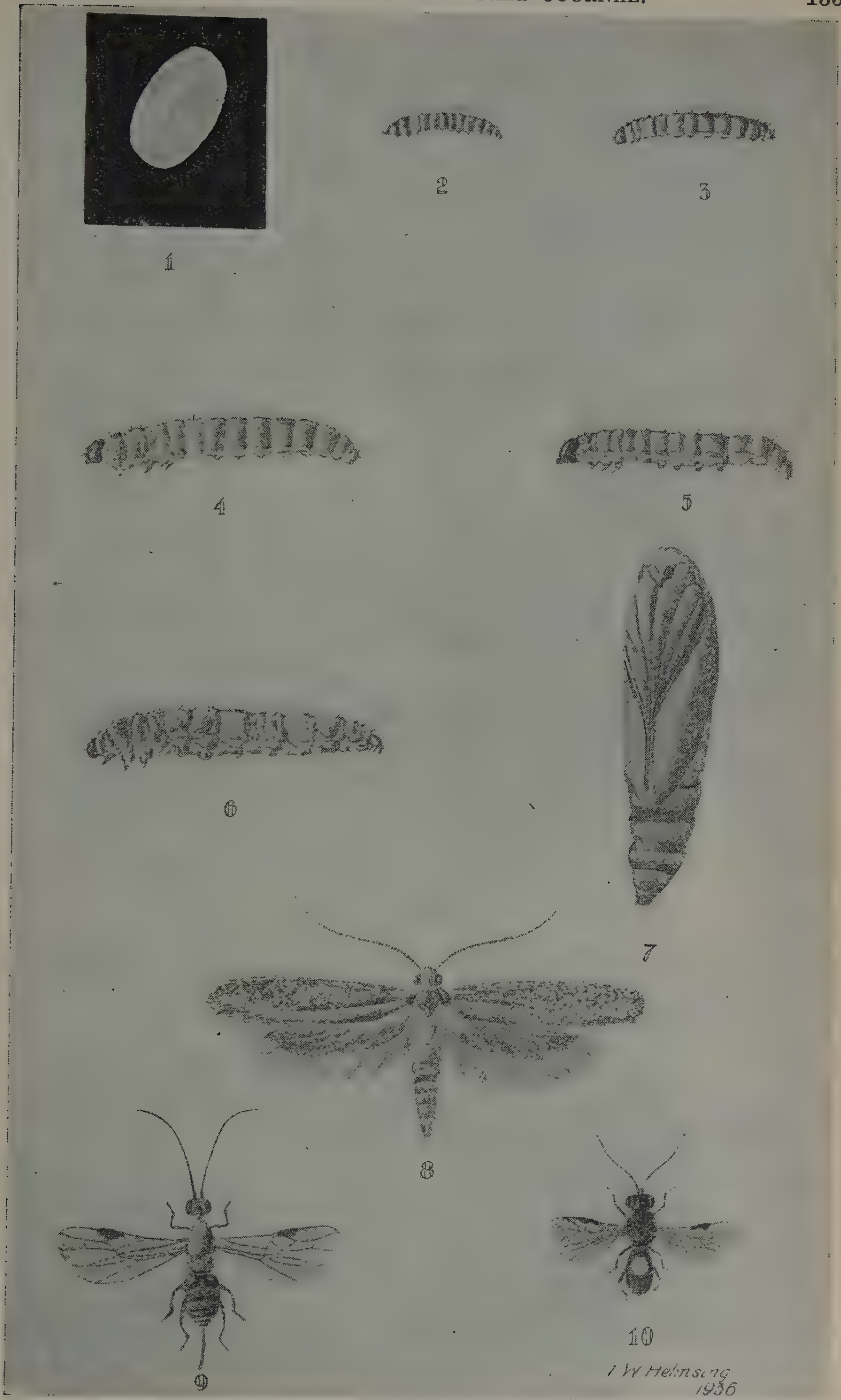


PLATE 37.—TOBACCO STEM BORER (*Phthorimæa heliopa* LOW.).

Fig. 1.—Egg x 35. Fig. 2.—First larval instar x 10. Fig. 3.—Second larval instar x 10. Fig. 4.—Third larval instar x 10. Fig. 5.—Fourth larval instar x 10. Fig. 6.—Fifth larval instar x 4. Fig. 7.—Pupa x 7. Fig. 8.—Adult x 4. Fig. 9.—Larval parasite x 4. Fig. 10.—Larval parasite x 4.

TABLE 5.

LIFE HISTORY OF THE STEM BORER.

Date Eggs Laid.	Days Duration of Life History Stages.				Date Moth Emerged.	Sex.
	Egg.	Larva.	Pupa.	Total all Stages.		
1932—					1932—	
1 August	10	31	12	53	23 September	♂
1 August	10	40	11	61	1 October	♀
14 October	4	25	6	35	18 November	♀
14 October	4	26	9	39	22 November	♂
14 October	4	29	9	42	25 November	♀
22 October	4	27	9	40	1 December	♀

Larva.

The newly-hatched stem borer larva is very small, being approximately 1 mm. in length, and is white with a brown head and prothoracic shield. The mature larva (Plate 37; fig. 6) attains a length of about 11 mm. and is creamy white in colour, with a light brown head and prothoracic shield.

It has been suggested that the favourite point of entry into the stem is close to the base of the leaf petiole under the bud (Jack, 1927). In North Queensland, however, entry into the stem is almost invariably by way of the leaf midrib. Young plants less than four weeks old may be attacked, and in these the larva enters one of the small leaves near the growing point, mines into the midrib and thence makes its way into the stem. The results of its tunnelling afterwards appear as contortions produced in the leaf midrib. More mature leaves are also entered, but in these there is no induced contortion of the midrib. Entrance into the leaf lamina may be effected near a vein, which the larva soon enters, gradually working its way towards the midrib and finally entering the stem. As the larva mines along the vein or midrib lateral excursions may be made into the tissue of the lamina and the results of these are visible as small mines between the two leaf surfaces (Plate 38; figs. 1 and 2). This lateral mining is a very common feature, but is not necessarily always manifest. In any case the mines are small, often linear, and usually extend over less than 0.25 square centimetres. One larva may be responsible for as many as ten of these small lateral mines, but fewer are more usual. In other cases the tiny larva enters the lamina some distance from a vein of any size and eats its way through a small mine, no larger than is necessary to contain its body, almost straight to a vein and thenceforth, without any lateral mining, directly through the midrib into the stem. Other larvae may enter the leaf directly through a midrib or a large vein and, if the leaf is quite large when entered, the stem may not be reached at all, pupation taking place in the lower portion of the midrib (Plate 38; fig. 3.) There is no local evidence to show that the stem borer at any time leaves the protection of the plant. Although the small mines in the leaf tissue may not be occupied for any length of time, when they are vacated the larva does not break through the surface but continues the mine into a vein. c.f. "———— occasionally they bore into the leaf tissue and make holes in it, but in these cases, the larva generally quits the leaf tissue and begins a fresh burrow in a vein" (Keuchenius, 1915).

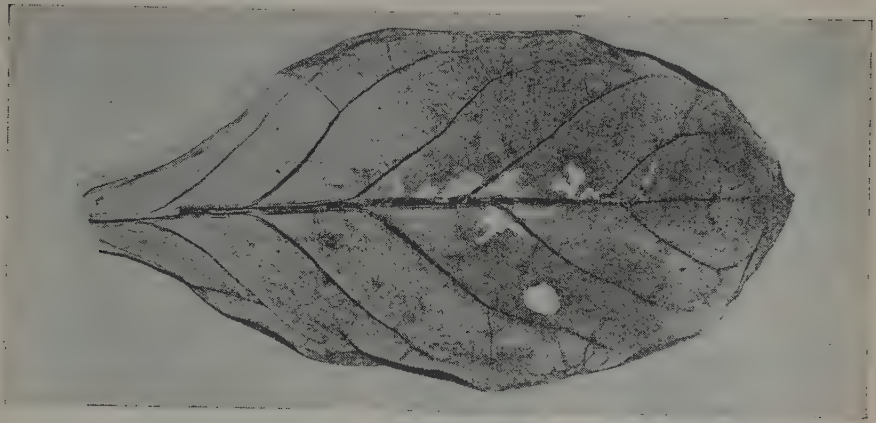


Fig. 1.

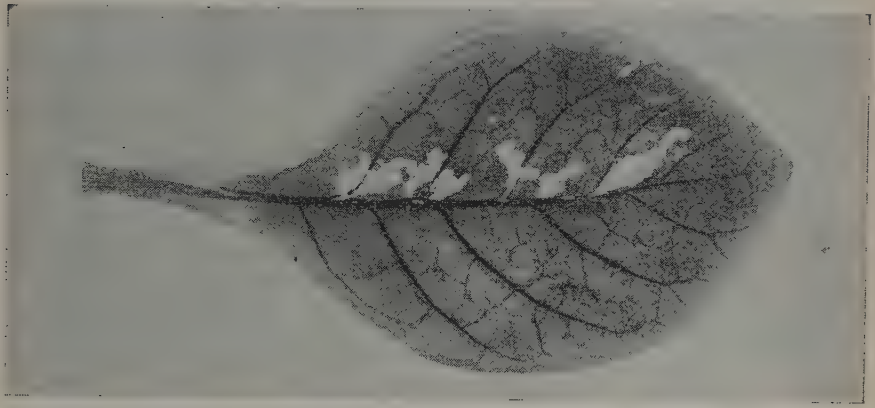


Fig. 2.

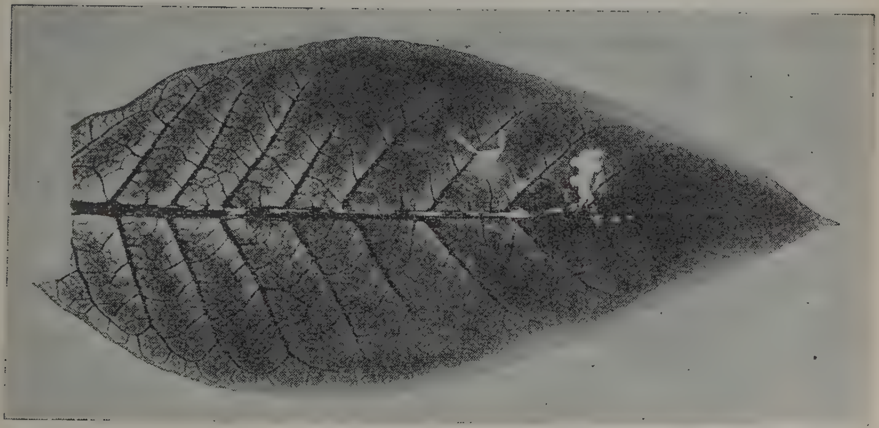


Fig. 3.

PLATE 38.

TOBACCO STEM BORER (*Phthorimœa heliopa* LOW.).

Figs. 1, 2, and 3 all display leaf mining activities by the larvæ of the tobacco stem borer. Pupation occurred in the leaf illustrated in Fig. 3.

However, when partly developed larvae were taken from one plant in the laboratory and placed on another they showed no hesitation in entering the new leaf, often through a vein or the midrib, and usually completed their development normally. In such cases no subsidiary mining of the leaves was observed.

Although entrance into the plant is usually effected through the leaves, other avenues are sometimes utilised. Larger plants in the seedbeds may be attacked through the stem. The larvae burrow directly into the pith through the vascular cylinder where the latter is attenuated in the vicinity of leaf petioles.

There are five larval instars (Plate 37; figs. 2 to 6), which is rather interesting in view of the occurrence of only four in the leaf miner. When full grown the larva eats its way through the enclosing tissues of leaf midrib or stem until the epidermis of the plant is reached, but the epidermis is left intact to cover a small circular opening about one-twelfth of an inch in diameter. When development takes place in a young plant the larva has very little woody tissue to traverse in extending the emergence burrow to the epidermis, but when the larva has developed in the pith of a large plant supported by a robust vascular cylinder, woody tissue up to one-sixth of an inch in thickness may be tunnelled in order to reach the surface. The larva then retreats a short distance from the future emergence hole, shrinks in length and spins a cocoon prior to pupation.

Owing to the practical impossibility of following individual larvae through their various instars no data on the relative duration of these were obtained. There was, however, a considerable acceleration of larval growth in summer as compared with winter. The time occupied in the larval stage during the Cairns winter varied from thirty-one days to forty days, but in early summer the same stage varied from twenty-five to twenty-nine days (Table 5).

Dyar's Hypothesis.

Without the aid of Dyar's hypothesis it was very difficult to determine the number of larval instars because, owing to the feeding habits of the larvae, it was impossible to follow the several ecdyses of one individual from hatching to pupation. Numerous measurements of larval head capsules were made, using the same method as that described for the leaf miner. These measurements disclosed a complete range of head capsule sizes from 7 to 42 divisions of the scale (Graph 4), and at first glance it appears impossible to apply the hypothesis, but a closer examination shows that the sizes of all head capsules measured are distributed in a series of five subsidiary ranges, each of which is taken to represent an instar. This is made clearer if three individual measurements are deleted from each of the sizes; where there are three only, or less, all are deleted from the relevant size. A glance at Graph 5 will show that the supposed range for each instar is very large. Nowhere is there the same definite break between groups of sizes for successive instars as is seen in the case of *P. operculella*. The evidence indicating five instars was not considered conclusive until a series of measurements, giving the size of a cast head capsule and the size of the head of the larva resulting from the ecdysis that yielded the head capsule, was obtained. This series is recorded in Table 6, and in every case there is no doubt that the larva whose head was measured was the same individual as that producing the corresponding cast head capsule.

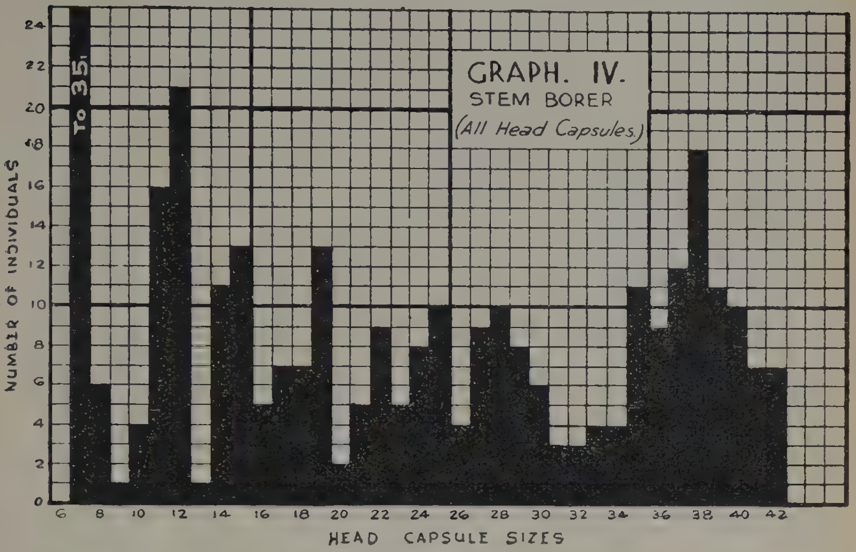


PLATE 39.

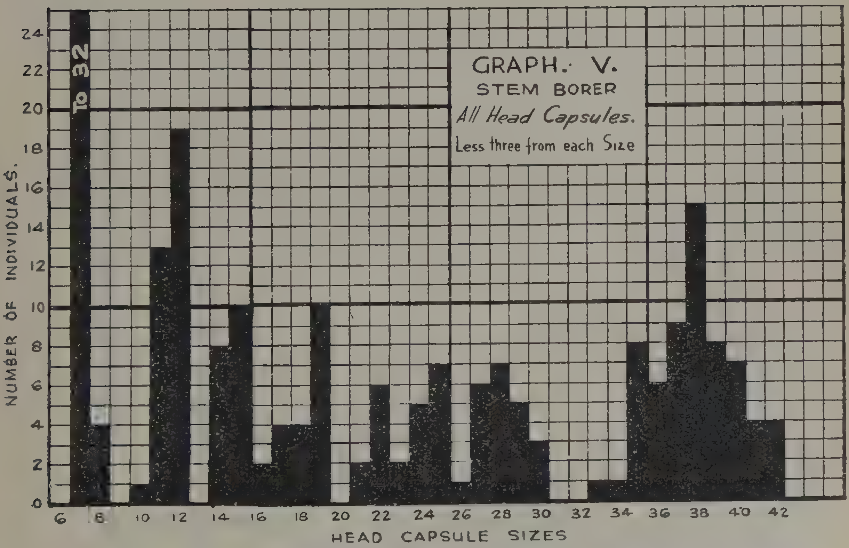


PLATE 40.

TABLE 6.

HEAD CAPSULE SIZES BEFORE AND AFTER OBSERVED ECDYSES IN THE STEM BORER WITH THE RATIO OF INCREASE INSERTED (38 UNITS = 1 MM.).

Before.	Ratio.	After.	Before.	Ratio.	After.
7·0	1·429	10·0	19·2	1·563	30·0
7·2	1·666	12·0	23·0	1·479	34·0
11·0	1·318	14·5	24·2	1·488	36·0
12·0	1·283	15·4	24·4	1·475	36·0
13·5	1·704	23·0	24·5	1·526	37·4
12·0	1·533	18·4	24·5	1·551	38·0
14·2	1·972	28·0	25·4	1·296	38·0
14·5	1·862	27·0	26·0	1·346	35·0
15·4	1·559	24·0	26·0	1·538	40·0
15·4	1·571	24·2	27·0	1·333	36·0
16·0	1·437	23·0	27·5	1·513	41·6
16·4	1·677	27·5	28·0	1·250	35·0
16·5	1·346	22·2	28·0	1·393	39·0
18·5	1·324	25·5	30·0	1·400	42·0

The table shows that the average ratio of increase calculated form observed individuals is 1·48, but there is extreme variation in certain cases, the ratio ranging from 1·25 in one case to as high as 1·97 in another. However, if there is any reason for Dyar's hypothesis, it must be obvious from the average ratio that there are five larval instars for this species, and this evidence in conjunction with that presented in Graph 5 is considered conclusive. For example, if the average ratio of increase is 1·48 and the size of the first larval head capsule 7·0, then the succeeding larval head sizes would be 10·4, 15·4, 22·8, and 33·9. These sizes can be accommodated in the groups as shown in Graph 5, but the average size for the first and last groups in the same graph are 7·1 and 38 respectively. Thus, if there are five instars, these averages mean that calculated on a graph which disregards three individuals of each head size, the average ratio of increase for successive instars is 1·52.

Actual measurements of first instar larvae varied from 6·6 to 8·0 scale divisions, and if 1·52 is used as the ratio of increase the consequent range of the fifth instar group would be from 35·25 to 42·75, whereas actually it is from 33 to 42. The observed ranges in size for the various instars are compared in Table 7 with the ranges calculated on the 1·52 ratio.

TABLE 7.

HEAD CAPSULE SIZES OF STEM BORER.

Head Size.	Instar I.	Instar II.	Instar III.	Instar IV.	Instar V.
Calculated ..	6·6—8·0	10·0—12·2	15·3—18·5	23·2—28·1	35·3—42·7
Observed ..	6·6—8·0	10·0—12·0	14·0—19·0	21·0—30·0	33·0—42·0

Two further series of head capsule measurements of *P. heliopa* were made, one of cast head capsules and the other of larval head capsules (Graphs 6 and 7). It is obvious from Graph 6 that the sizes of cast head capsules in this case fall naturally into four groups, the average for successive groups being 7·0, 11·0, 16·5, and 25·9, while the average

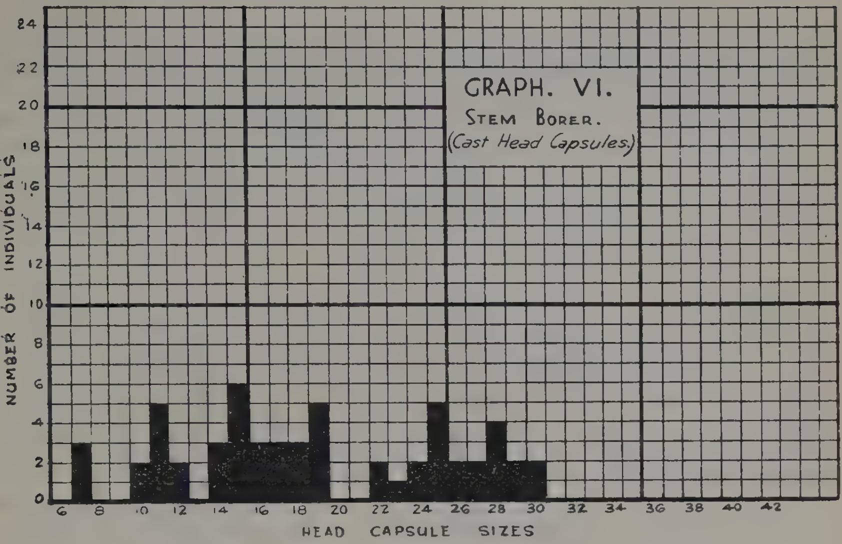


Plate 41.

ratio of increase between successive instars is 1·55. A fifth group does not occur, as head capsules cast by final instar larvae are obviously too distorted for measurement. The grouping is less well defined with larval heads, but the average values for the sizes of successive groups are 7·2, 11·5, 16·6, 25·6, and 37·4, the average ratio of increase being 1·51. This comparison of the two series shows that the sizes of cast head capsules are comparable with those of larval heads and therefore all can be grouped together when applying Dyar's hypothesis to determine the number of instars.

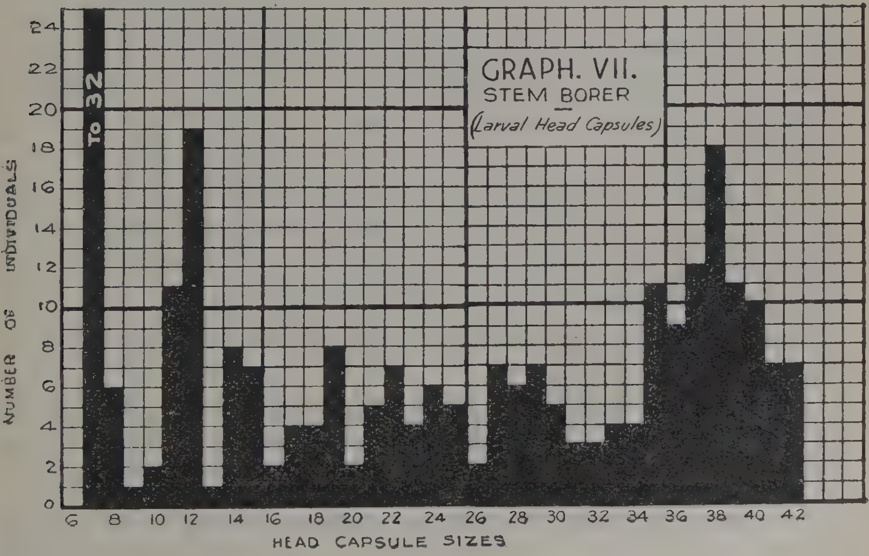


Plate 42.

The above discussion emphasises the fact that the hypothesis can be of some value and that it has been useful in determining the number of larval instars in the stem borer. There is, however, a great deal of variation from the normal ratio in certain cases and throughout the whole series of measurements the range of variation for the later instars is much greater than in *P. operculella.* The extension of the size range with each successive instar is very marked and it is obvious that the hypothesis may not be so rigidly true as was implied originally by Dyar in his definition (Fisher, 1924).

Pupa.

When a large well-grown leaf has been attacked and the larva has completed its development without reaching the stem, the pupa is formed in the leaf midrib and there is no cocoon. Normally development is completed in the stem and pupation with the formation of a cocoon occurs in a cavity in the pith. In the stem, particularly of small plants, growth around the injured parts induces the formation of a large calloused cavity (Plate 43; fig. 3), but there is no large cavity formed in the leaf midrib. This may account, in part at least, for the formation of a cocoon in the stem and its omission in the midrib. The cocoon in the stem (Plate 43; fig. 3) is often modified so that parts of the walls of the cavity can be used. Its silk matrix is similar to that used by the leaf miner for the same purpose, and particles of frass are often found attached to the sides of the structure. One end of the cocoon frequently fits as a sleeve into the inner end of the emergence burrow, but seldom extends as far as the epidermis covering the hole.

The pupa (Plate 37; fig. 7) is light green in colour when first formed but soon darkens to light brown and later becomes almost black. Pupae naturally vary in size, but the average length is about 7 mm., and as a rule the male pupa is slightly smaller than the female, the abdomen in the latter being less acute than in the male. The cocoon may be formed either above or below the emergence hole, but the head of the pupa is always directed towards the exit (Plate 43; fig. 3). It is generally placed some distance from the hole and may be as far back as 10 mm. along the emergence burrow.

The pupal stage in Cairns occupied from eleven to fourteen days in winter, but in early summer at the same centre eight and nine days were recorded.

Length of Life Cycle.

Unfortunately, the difficulties associated with breeding this species under laboratory conditions were such that few records of the complete life cycle were obtained. These are recorded in Table 5 and show that the total length of the cycle from egg to adult in the laboratory varied from sixty-one days in winter to thirty-five days in summer. Thus, under similar conditions, the species develops more slowly than its congener *P. operculella.*

Temperature and Development.

As detailed figures recording the duration of the several stages in the life history of this species are so meagre, the correlation of temperature and development must be made from somewhat inadequate premises. The data are insufficient to postulate independently a value for the threshold of development and no reference to this datum has been found in the literature. However, it has been considered justifiable, for the

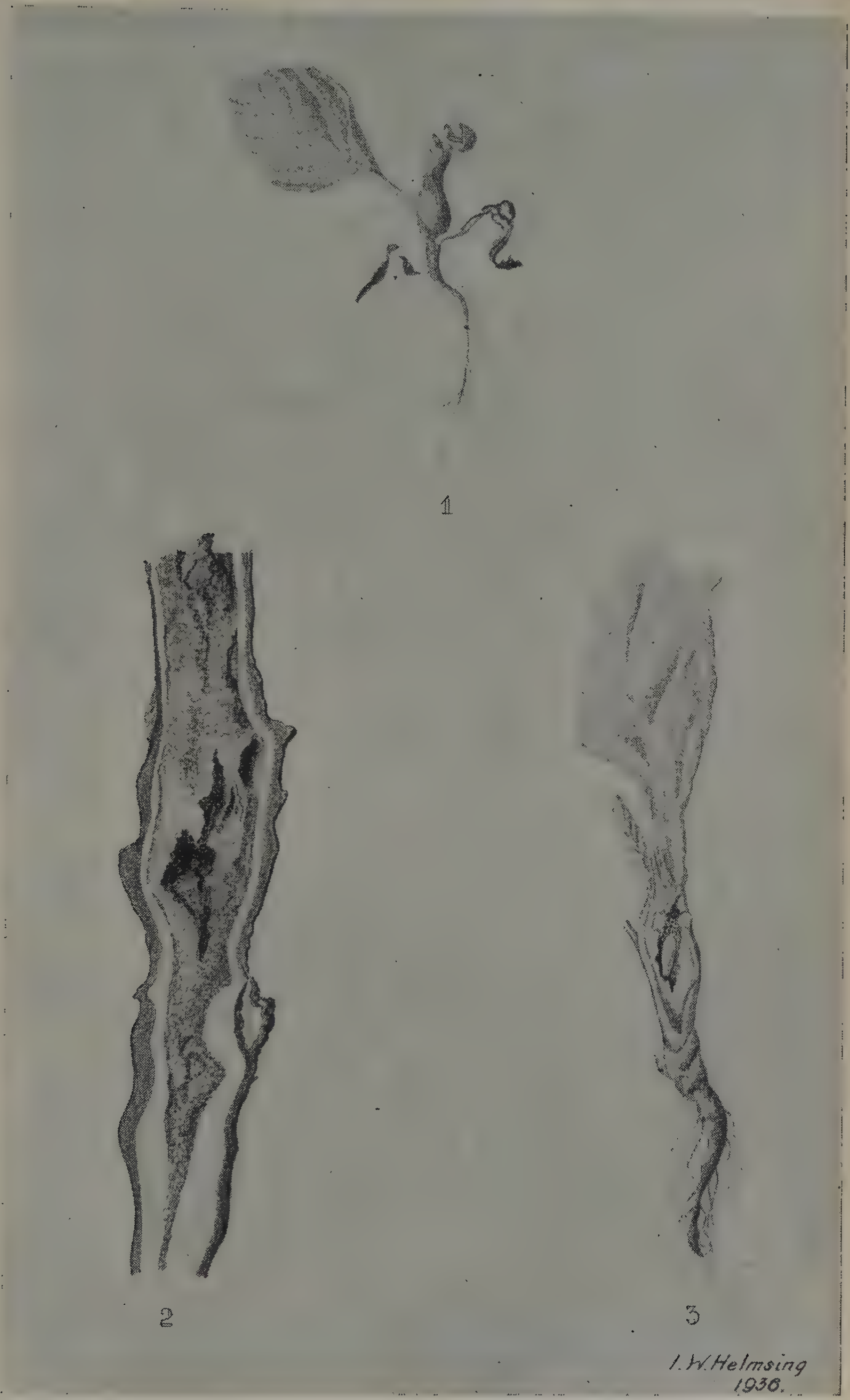


Plate 43.—Tobacco Stem Borer (*Phthorimæa heliopa* Low.).
Fig. 1.—Seedling showing gall development; Fig. 2.—Mature stem tunnelled by stem borer. Fig. 3.—Plant showing pupa *in situ*. Cavity of gall exposed.

time being, to assume a figure corresponding to that for the leaf miner. Accordingly the effective day-degrees calculated on a threshold of development of 52 degres Fahrenheit have been used. Complete life history records for several individuals were obtained, and the effective day-degree requirements of these are presented in Table 8. For the egg stage the figures vary from 109 to 126, the mean value being 117 ± 8·6; for the larval stage from 555 to 797, the mean being 703 ± 81; and for the pupal stage from 158 to 252, the mean being 230 ± 36. The total effective day-degrees required from the day the egg is laid till the day the adult emerges varies from 907 to 1,158, about a mean of 1,050 ± 95.

TABLE 8.

TEMPERATURE AND DEVELOPMENT OF THE STEM BORER AT CAIRNS IN 1932.

Date Eggs Laid.	Effective Day—Degrees.				Date Moth Emerged.
	Egg.	Larva.	Pupa.	Total.	
1932—					1932—
1 August	126·25	555·32	225·75	907·32	23 September
1 August	126·25	712·82	247·25	1,086·32	1 October
14 October	108·75	694·50	158·25	961·50	18 November
14 October	108·75	718·75	247·75	1,075·25	22 November
14 October	108·75	797·25	251·75	1,157·75	25 November
22 October	120·75	741·25	247·00	1,109·00	1 December
Averages	116·58	703·32	229·63	1,049·52	..

Moth.

The eclosion cap as described for the leaf miner is present in the stem borer also, and is carried on the head as the moth bursts its way from the pupal shell through the epidermis covering the exit hole. The pupal exuvium remains in the cocoon.

Eggs were laid in the laboratory from two to eight days after first enclosing males and females together. Egg laying may continue at irregular intervals for as long as twenty-two days after the first mating, but as a rule most of the eggs are laid within ten days of this event. In the laboratory, observations were made once each day and very often it was found that the number of eggs laid on the first day of egg laying was far greater than that for any subsequent day. The greatest number of eggs definitely known to have been laid within any one twenty-four hour period is 149. These were laid by a moth which had emerged two days previously and was mated on the day of emergence. Other figures recording the number of eggs laid by one moth within twenty-four hours of the beginning of egg laying are 80, 89, 103, 105, 107, 110, 132, 133, and 139. No egg laying was observed during the day between the hours of 9·0 a.m. and 6·0 p.m. and it is presumed from the activity displayed between 6.30 p.m. and 10.30 p.m. that eggs may be laid in the field at that time.

The number of eggs laid in the laboratory by fertilized females varied from 151 to 413, with an average of 238, in the winter months; and from 42 to 364, with an average of 205, in the early summer months.

It was impossible, however, to determine the number of eggs laid under field conditions. Under laboratory conditions eggs were laid indiscriminately on both glass and cloth surfaces enclosing the moths. Laboratory evidence also indicated that the moths prefer the plant for oviposition and that very few eggs are laid on the ground. Observations in seedbeds showed that eggs were laid singly on the leaves of plants and they occurred on either surface, though the majority were found on the under surface. Numbers of eggs were laid on the midrib at its base close to the petiole and eggs were found also on the stems of plants in seedbeds. It has been recorded that elsewhere "the fact that the plants are close together prevents oviposition and only those on the borders of the beds are attacked" (Keuchenius, 1915). In closely planted experimental seedbeds near Cairns, however, numbers of eggs were found on plants even in the middle of the beds.

At odd times throughout the laboratory observations eggs were laid by unmated females, but except in one instance, such eggs were infertile. Infertile eggs had a normal appearance when laid, but the usual darkening in colour, associated with embryonic development, failed to materialise and the eggs retained their creamy hue for several days. Later the chorion commenced to wrinkle as the enclosed food materials were dessicated and shrank until, by the time a normal egg would have hatched, the infertile eggs were quite shrivelled. The single unmated moth already referred to as having laid fertile eggs was isolated in the pupal stage and after emergence was given no food. A number of eggs were laid by it and from four of them apparently normal larvae developed, but only one of these was successful in establishing itself in a leaf and in due course it began tunnelling down the midrib. After this larva had reached the fourth instar it died, presumably from starvation, during an unavoidable absence from the laboratory.

One male is capable of fertilizing more than one female, and in the laboratory a single male fertilized three females which thereafter laid over 400 fertile eggs between them in ten days. There are indications that repeated acts of coition are necessary for the continuance of normal oviposition, the evidence in support of this view being as follows:—Two females were mated on 23rd November, and separated from the males on the following day, and after the 30th of the month the percentage of fertile eggs decreased. Between the 25th and the 30th, inclusive, 191 eggs were laid and all were fertile, but of 87 eggs laid between the 1st and the 6th of December, only 40 per cent. were fertile, all the eggs laid on 6th December being infertile. When the female and male were kept together continuously the percentage of infertile eggs was always small.

The number of eggs laid by unmated females, quite apart from the question of fertility, is definitely far lower than the number usually laid by mated moths. Some unmated females died without laying, but others laid from 5 to 103 eggs. Unmated females laid their first eggs from nine to thirty-one days after emergence. Females mated soon after emergence laid more eggs as a rule than those not mated until several days thereafter. If moths were mated within twenty-four hours of emergence eggs were often laid within two days, but if mating was delayed several days the commencement of oviposition was appreciably retarded.

From the evidence obtained during the laboratory observations on the life history of this species it appears that unmated moths live longer than mated individuals. One unmated female lived six weeks in winter, whereas the longest time a mated moth lived during that season was three weeks and the average life of mated females was only two and a-half weeks.

Injury.

The presence of this injurious insect is seldom noticed until it has done a great deal of damage in the seedbeds. The leaves of small seedlings are not large enough for the midrib to afford sufficient nutriment to carry the larva through to maturity and in such plants the stem borer invariably makes its way into the stem before completing development. A more or less pronounced gall formation in the stem of the seedling (Plate 43; fig. 1) is characteristic evidence of attack by this pest, and as a rule the gall is formed about an inch below the growing tip. After entering the stem the young larva continues feeding on the available succulent tissue, which in this case is the pith, and the resultant irritation to the young tissues of the plant causes an abnormal proliferation of cells around the larval mine. Thus, eventually, a well-pronounced gall is formed in the interior of which the larva feeds. The larva may eat its way up into the growing tip and the destruction of the meristematic region results in the death of the terminal bud, followed by a general wilting and the death of the whole plant. As a rule, however, the injury is not so severe and the plant lives on, although galled and distorted. The more severely affected seedlings assume a rosette-shaped top as a result of the bunching in the original growing tip and suckers, the latter of which are produced in some profusion. Unfortunately, the gall formation does not take place until the larva has reached an advanced stage in its development, and until the gall has been formed the presence of the stem borer is far from obvious. Thus there is always the danger of planting infested seedlings in the field, with a resultant loss of time when replanting becomes necessary. Sometimes several larvæ are found in each of the plants in the seedbed, although one is sufficient to ruin small seedlings. Later infestation which takes place in the field has, however, less severe effects on the vitality of the plant. The rapid growth after the seedling recovers from transplanting during favourable weather is probably responsible for this, but should dry conditions occur immediately after planting out losses may be severe. Under optimum conditions the transplants generally grow very quickly and thus have developed a large amount of pithy tissue before the larva has reached a size at which appreciable destruction is possible. Sometimes, however, infestation at the base of the plant is heavy and practically all the pith and part of the wood of this area may be destroyed. These attacks at the base result in an obvious distortion of the stem just above ground level and they weaken the supporting woody tissue. After the moths have emerged, their exit holes leave the way open for the entrance of various saprophytic growths, which further weaken the plant and thus lead to heavy losses during windy weather. In Greece bacterial diseases on tobacco first appear on plants attacked by stem borer and afterwards spread to other plants (Cavadas, 1927).

Infestation of the more mature plant may be less localised and the larvæ are then found tunnelling in the pith (Plate 43; fig. 2) throughout the whole length of the plant. Mature leaves may also be heavily infested and as many as eight stem borers have been taken from the midrib of one large leaf. These general attacks so weaken the plant that the quality of the leaf is seriously affected and may be lowered to such an extent that the crop is not worth harvesting. Such extreme cases as the latter are fortunately rare, but frequently many individual plants in a crop are rendered practically valueless.

Direct losses of 5 per cent. to 30 per cent., or even more, occur in seedbeds through the obvious necessity of discarding galled seedlings and are not uncommon throughout infested areas in North Queensland. These losses may be supplemented by further losses after transplanting when stem borer has been overlooked at the time of the removal of the seedlings from the seedbeds. It is more difficult to estimate the numerical losses in the field, but occasionally they are very severe. The damage is not confined to the loss of the actual plants, but is increased by the resultant loss of time necessarily implied.

The importance of stem borer as a pest in the field varies considerably from time to time, even in the life of a single crop. This point was well illustrated early in January, 1935, during a survey of the Dimbulah district, which showed that large areas had been planted five and six weeks previously and had since then received no rain. Most of the plants were from nine to fifteen inches in height and from 50 per cent. to 80 per cent. were infested by stem borer. Fortunately, however, rain fell after the six weeks' drought and was followed by good growing weather. Infested plants were then cut back to a selected sucker and nine weeks later all heavily infested fields had apparently recovered and carried fair crops of well-grown leaf, much of which cured to satisfactory commercial grades of tobacco.

[TO BE CONTINUED.]

PLATE 44.
Junction of Mulgrave and Russell Rivers taken from the Mulgrave.

Paspalum Ergot.

By R. B. MORWOOD, M.Sc., Plant Pathologist.

PASPALUM is still the most popular summer growing pasture grass in the coastal dairying districts. The widespread occurrence of a serious disease in this grass in therefore of considerable concern to farmers and all connected with agriculture. The disease described in these notes does not lead to the depletion of the pasture but its presence is injurious to stock.

The disease is first seen as a dark sticky exudate on the heads oozing from the developing seed. The exudate contains countless spores which are given off together with the gummy matrix by a fungus growing between the glumes. This is the summer stage of the fungus which causes the disease.

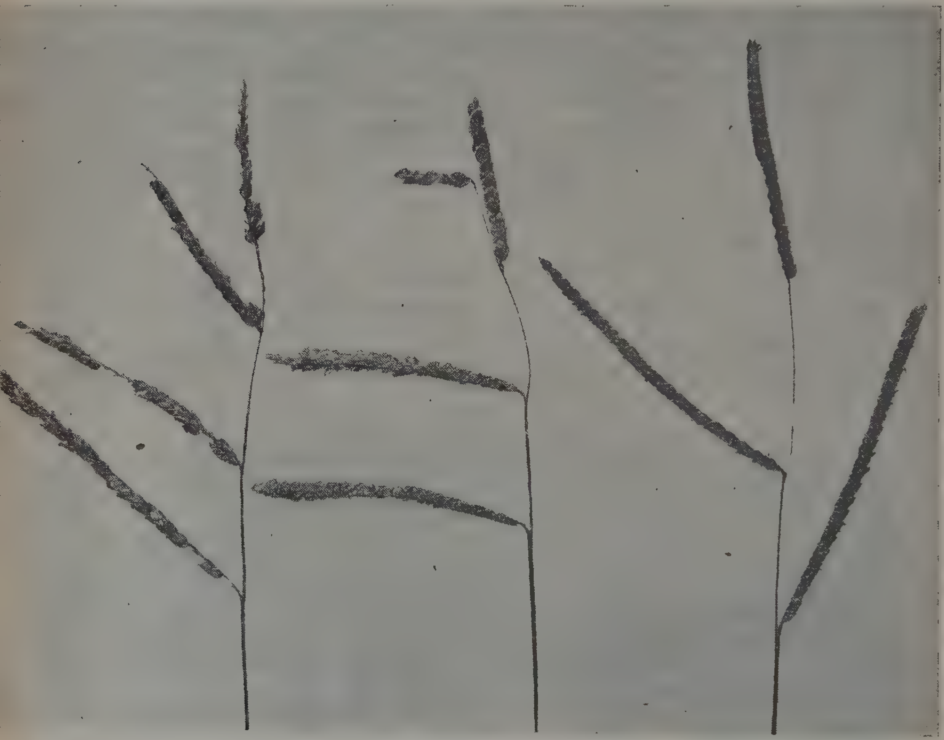


PLATE 45.

The summer stage of the disease. Sticky drops are present when the disease is seen on the plant. Healthy head to right.

The seasonal cycle of the fungus has not as yet been followed through in Queensland, but elsewhere under suitable conditions the stage described above is followed by the formation of resting bodies or sclerotia on the seed heads. The sclerotia are globular, about $\frac{1}{8}$-inch in diameter, and consist of compact fungus tissue. They are yellowish grey in colour and give the infected paspalum head an irregularly swollen appearance. The sclerotia are formed in the Autumn and fall to the ground, where they lie during the winter. Late in the following Spring the sclerotia germinate and develop into small structures which produce special spores known as ascospores. These spores serve for the initial infection of paspalum heads and the disease is subsequently spread by the summer spores in the sticky exudate already noted. The spores are doubtless spread by insects and by adherence to clothing, animals' legs, etc. The fungus is known to science as *Claviceps paspali*, and the summer stage is referred to the genus *Spacelia.*

Paspalum ergot is closely related to ergot of rye, and like it is poisonous. The summer stage characterised by the sticky exudate contains little, if any, of the poisonous principle. This is produced in the sclerotia, becoming concentrated as they get older. The symptoms produced on cattle resemble staggers. The poisoning does not usually result in the death of the stock, but losses may occur due to bogging of cattle in their weakened condition or to starvation if they are unable to rise.

The eradication of a disease of this nature from pastures is a very difficult problem. It can be kept in check, however, by the adoption of intensive rotational grazing, thereby largely preventing the formation of seed heads. Where a mower can be used this provides a supplementary means of getting rid of the seed heads before they form sclerotia. If, in addition to mowing, a quick fire can be got through the cut grass the disease may be eradicated—at least temporarily. If badly diseased grass gets out of hand it should be burnt over at the first opportunity. Where difficulty is encountered in dealing with this disease serious consideration must be given to the replacement of paspalum with kikuyu or other suitable grass.

PLATE 46.
The junction of the Mulgrave and Russell Rivers taken from the Russell.

Contagious Bovine Pleuro-pneumonia.

By C. R. MULHEARN, B.V.Sc., Animal Health Station, Yeerongpilly.

CONTAGIOUS bovine pleuro-pneumonia, commonly known as "pleuro," is a highly infectious disease of cattle affecting the respiratory organs. It is caused by a very minute organism which can only be seen by the aid of a high-powered microscope. This germ is present in the virus and in certain organs in natural cases of the disease and it can be isolated and is now used in the preparation of a vaccine for inoculation purposes.

It is considered that the infection is air-borne—i.e., the germs are passed out from the lungs of the diseased animal and are taken into the lungs of the susceptible animal in the act of breathing. It is by this means that the disease spreads from beast to beast.

All types and ages of cattle are susceptible to the disease, and outbreaks are commonly encountered in travelling stock. Experimental cases have been produced in sheep and goats, although there is no record of the disease in these animals under natural conditions.

The Carrier Problem.

Contagious pleuro-pneumonia is a highly fatal disease and in some outbreaks a large percentage of the susceptible cattle become affected with up to a 50 per cent. mortality. In every outbreak which is not under control a certain number of the affected animals recover and, undoubtedly, a large number of these retain diseased tissue within their lungs, although, to outward appearances, they look perfectly healthy. These animals are known as carriers and they are responsible for fresh outbreaks often widely separated from the centre in which they originally contracted the disease. Under normal circumstances the carriers may remain healthy, for the diseased tissue is encapsuled, but conditions such as starvation, overdriving, &c., lower their resistance and the disease may reassert itself. It is for this reason that outbreaks are frequently encountered in travelling stock. The relapsing animal may not suffer from a severe attack of the disease—it may not even be detected as being diseased—but it passes the germs from its lungs to the exterior and so acts as a constant source of infection to the surrounding animals.

The disease is constantly present on many of the large cattle stations of Northern Australia and, unfortunately, it is impossible to eradicate it from these areas. Consequently each year a number of apparently healthy animals, which are carriers, are moved into the more closely settled areas and they are responsible for fresh outbreaks from time to time. It is obvious, therefore, when the broad view is taken, that no animal, once it has become infected with the disease, should be allowed to recover. If all the infected animals and carriers could be detected and destroyed the disease could be eradicated from Australia, as it has been from other countries, within a few years. However, this is not possible under the present grazing conditions of the large cattle stations, but the elimination of carriers will play a very important part in the control of the disease in the more closely populated areas of this State. As a result of recent research work by the Council for Scientific and Industrial Research, carrier animals can be detected by means of a blood test,[1] and this test could be used to eradicate the disease should outbreaks occur in the dairying districts.

Symptoms.

The susceptibility of individual animals varies considerably. Some may pass through a mild attack of the disease without showing noticeable symptoms. However, the majority of the infected animals show obvious evidence of the disease.

In travelling cattle one of the first signs of the disease is an inclination of the affected animals to drop to the rear of the mob, whilst with dairy cattle there is a marked falling-off of the milk supply. If the temperatures are taken at this stage it will be found that they are abnormally high, ranging from 103 degrees to 106 degrees. The sick animals seek the shade, and show evidence of thirst, although the appetite is diminished and cudding is restrained and it eventually ceases. The coat becomes ruffled and the ears droop, and the beast has a generally dejected appearance. Intermittent coughing may be noticed, and this is particularly evident after exertion. A common method of detecting the disease is to race the suspected animals around for a few minutes, when the positive cases show fits of coughing. This, of course, is not diagnostic of contagious pleuro-pneumonia, but it is a useful method of picking out suspicious animals for closer observation. As the disease advances the respirations become quickened and a normally docile animal, when disturbed, will often charge the attendants. At a later stage the animal stands with its head extended, its forelegs wide apart, its back arched, and its flanks heaving owing to respiratory distress. In fatal cases death usually follows in from four to seven days after the onset of obvious symptoms. In cases that recover the animal gradually regains a normal appearance and recommences feeding, but it will still cough following exertion during the convalescent period.

Post-mortem Findings.

As the name implies, the disease affects the lungs and surrounding tissues, and it is in these organs that the changes are detected in the dead animal. On opening up the chest cavity a quantity of fluid commonly known as the "virus" may be found therein. The virus may vary in amount from a cupful or less to 1 gallon or more. It also varies in colour from a clear amber to that of a port wine. The darker colours are usually due to the presence of blood. This fluid may be quite clear or it may be slightly turbid, and it usually contains jelly-like masses. The name "Dry Pleuro" is sometimes applied to those cases in which very little virus is present, and some stockmen consider it is a different disease. However, this is a fallacy, as there is only one contagious pleuro-pneumonia.

The lungs are usually found attached in various places to the chest wall, and both the covering of the lungs and the lining of the chest wall are considerably thickened. On inspection it will be found that the diseased portion of the lung is considerably swollen and much firmer than normal. In consistence it resembles liver rather than lung tissue. The cut surface of the lung in most cases presents a typical picture, and it somewhat resembles a piece of marble, the veins of which are of a whitish colour and are formed by the greatly thickened connective tissue which separates the reddened areas of lung tissue. These typical lung changes are not present in all cases of contagious pleuro-pneumonia, for sometimes the marbling effect is not present in the lung lesions, which then more or less resemble a normal interstitial pneumonia. In the typical cases a small quantity of virus frequently flows from the cut surface of the lungs. The mediastinal and bronchial lymphatic glands (between the two lungs) are often enlarged, and may show pronounced changes.

Prevention and Control.

There is no treatment for contagious pleuro-pneumonia. Once an animal contracts the disease it should be destroyed. If animals are allowed to recover they frequently become carriers, and may be responsible for a serious outbreak of the disease at some future date.

The most important methods of dealing with an outbreak of "pleuro" are to destroy the diseased animals and to keep the "in-contact" animals well under control. All "in-contact" animals should be inoculated to give them an immunity so that no fresh cases, other than those already infected, will occur. As the period of incubation or the latent period between infection and obvious symptoms is considerable and may vary from a week to two months or more, a large number of animals may have become infected and be incubating the disease before the outbreak is discovered and inoculation carried out. It is for this reason that a number of cases occur for a varying period following successful inoculation, and consequently it is necessary to hold "in-contact" animals in quarantine for long periods to ensure that all the latent cases will be detected before the suspected animals are liberated.

Preventive inoculation is also carried out amongst healthy animals to render them resistant in case they are exposed to infection. Travelling stock coming from known infected areas or those which have to pass through infected country are usually treated in this manner.

Methods of Inoculation.

Inoculation as practised in Queensland consists in introducing a small quantity of fluid containing the germs under the skin towards the tip of the tail. When this is carried out a mild reaction is produced at the site of inoculation, and the animal gains a resistance to the disease. The area towards the tip of the tail is selected for inoculation because it is far removed from the centre of circulation and because if the local lesion following inoculation becomes extensive it can be controlled by cutting off the tail. If inoculation was carried out with fresh virulent virus on various parts of the body the lesions could not be controlled and they would spread extensively, causing heavy losses.

The fluid commonly used for inoculation purposes is that which collects in the chest cavity in active cases of the disease, and it is known as "natural virus." This fluid gives good results when used in the fresh state—i.e., when only a few days old—but its keeping qualities are uncertain, and it should not be used after it has been stored for long periods.

A vaccine for contagious pleuro-pneumonia inoculation has been evolved by the Council for Scientific and Industrial Research at its Townsville laboratory, and this product has been widely tested and has given good results. The writer actually had control of the testing of 10,000 doses of this product on travelling and station stock, and it proved very satisfactory. The vaccine is superior to the natural virus for many reasons, although good samples of the latter, when freshly taken, usually give satisfactory results.

The pleuro-pneumonia vaccine prepared by the Council for Scientific and Industrial Research, together with setons, can be obtained at the Animal Health Station, Yeerongpilly.

The common method of inoculation is that known as the seton method, and it consists of introducing a piece of wool saturated with fluid containing the germs under the skin of the tail. Special needles are required for this purpose. Another method consists of injecting three to five drops of the fluid under the skin of the tail by means of a special syringe, whilst in a third method the fluid is introduced by a special spoon-shaped needle.

No matter what method is used, it is essential to practise strict cleanliness in carrying out the operation.

It is the usual practice to bang-tail animals immediately after the operation to indicate that they have been inoculated.

Sometimes a number of "bad tails" follow inoculation. These are due to two causes:—

1. An excessive virulence of the virus.

Such virus sometimes produces extensive lesions which may spread up the tail and involve the muscles of the rump. If these lesions become infected with outside germs the area may become pussy and putrid. When such cases are detected in an early stage the tail should be cut off above the lesions with a clean knife to prevent the rump muscles from becoming involved. An occasional uncomplicated case of this nature is looked upon favourably, as it indicates that the virus is alive.

2. Dirty inoculations or contaminated virus.

The "bad tails" in these cases are due to foreign germs, introduced either by dirty methods or in the virus at the time of inoculation. The normal reaction following inoculation produces a condition which is favourable for the growth of the foreign germs, which then produce the "bad tail."

The inoculation gives an immunity against the disease, but the immunity does not always persist in 100 per cent. of the animals treated. Occasional cases may occur in inoculated animals, but a successful inoculation will prevent the spread of the disease through the mob. The period during which the immunity lasts is not definitely known, although it is thought to be at least twelve months.

Collection of Virus.

When virus is required an animal in a fairly advanced stage of the disease should be selected, shot, and bled. It is then propped up on its back, the abdominal cavity is opened up, and the intestines are removed without opening the chest cavity. One or both forelegs may also be removed. If a quantity of virus is present it causes the diaphragm (skirt) to bulge outwards. The virus is then collected by puncturing the chest cavity by means of a trocar and canular either through the diaphragm or externally between the ribs. The trocar is pulled out and the canular is left in position, and the virus flows out through it.

It should be collected in sterile bottles and 25 per cent. pure glycerine should be added. If jelly-like clots form in the virus they should be removed by straining through sterile cotton wool or through a piece of muslin or cheese cloth which has previously been boiled and wrung out. After collecting the virus the animal, and particularly the chest cavity, should be examined for the presence of other diseases, especially tuberculosis. If such disease is found the virus should be discarded.

Good virus should be clear, and it should be of a straw to amber colour. Discoloured or turbid virus should not be used. It has been estimated that on an average only one animal out of every four examined will yield suitable virus.

REFERENCE.

1. A. W. Turner, D.Sc., D.V.Sc., A. D. Campbell, B.V.Sc., and A. T. Dick, D.Sc. (1935). "Recent Work on Pleuro-Pneumonia Contagiosa Boum in North Queensland." The Australian Veterinary Journal, Vol. XI., No. 2.

SELECTING A SIRE.

The job of selecting a herd sire is probably one of the most difficult tasks assigned to a breeder of dairy cattle. A breeder should confess concern about his herd sire selection. Procurement of the right bull ensures improvement in his herd, whereas the wrong bull may completely destroy the results of several generations of careful breeding. How, then, may the thoughtful breeder be guided in this important decision?

First, he should make a very careful analysis of his existing herd. By so doing he thereby establishes a standard of both type and production to be maintained or improved by the new bull. This standard should be set not by the average cows in the herd, but from the top end of the herd.

Second, the bull selected should be healthy, well grown, and an active breeder.

Third, the actual selection of the bull will be confined either to an aged or meritorious sire or to a young bull. Very few meritorious proved sires are for sale. For this reason most breeders will be forced to limit their selection to young bulls. In selecting a young bull what evidence of transmitting ability is worth considering?

The transmitting ability of meritorious proved bulls has been established through the records of their daughters. It is reasonable to believe that a bull capable of siring 400 lb. daughters will transmit this same production to his sons. Therefore a son of a meritorious sire carries considerable promise. However, this sire is only one of the parents.

The dam also contributes to the inheritance of the bull. In considering the dam we should expect answers to the following questions:—

1. Is she of acceptable type?
2. Has she a good udder?
3. Is she a consistent producer and a regular breeder?
4. What are her lifetime production records?
5. Is she a daughter of a meritorious sire?
6. Has she any producing offspring?

We might also inquire as to the producing and transmitting ability of the maternal granddam, asking the same questions. The old adage "A good bull must have a good mother" is well written, and merits careful consideration in selecting a herd sire.

This procedure of analysis builds an inheritance pedigree of the young bull in question. A bull can transmit only those characters inherited from his parents. It is therefore important to measure this inheritance as completely and accurately as possible. Too often a bull rises to unearned fame through the records of a few high-record daughters. Uniformity of offspring is far more important and gives a more accurate measure of true transmitting ability.

A reputable and successful breeder should gladly co-operate in assembling this information. If he happens to be your neighbour, so much the better. Distance and foreign names do not make a bull more valuable.—E. T. Wallace, Purdue University (U.S.A.).

Problems of Pasture Maintenance and Rehabilitation in Semi-arid Queensland.

By C. W. WINDERS, B.Sc.Agr., Assistant (Agronomy).

Introduction.

IN the early days of settlement in Western Queensland the productive stands of native pastures that covered immense areas provided in most years sufficient feed for the livestock depastured thereon. For some years the major portion of the area occupied was devoted to cattle-raising and the meagre watering facilities kept the livestock carried at a fairly low figure. The native pastures were regarded as an inexhaustible supply of forage, and so lightly were the areas stocked that if the feed ran short in one place it was only necessary to move to a new area. With the development of watering facilities and the consequent splitting up of the large holdings, the grazing became more intensified and sheep have now replaced cattle over most of the western country. This intensification of grazing has resulted in a degree of utilization of the pasture more intense than hitherto experienced, and in the absence of authentic information concerning the best method of utilisation of the pasture many areas have been subjected to grazing conditions inimical to the good condition of the pasture. The ill-effects of injudicious stocking on Mitchell grass pastures over a period of years have been accentuated by recurring droughts, with the result that a demand has arisen for information on the problem of restoring depleted pastures. Though this is an urgent question it is no more so than the elucidation of the method of grazing a high-producing pasture which will afford the best utilisation of the forage and maintain the pasture in good condition.

Both problems are concerned primarily with the preservation of the best elements in the pastures and their extension to the exclusion of less valuable constituents. There is no question that the Mitchell grasses rank foremost in the list of useful pasture plants and that primary attention should be devoted to their reaction to various grazing treatments as well as to the other factors—climatic and soil—concerned in their development. Observations made and information obtained regarding the behaviour of Mitchell grasses under different conditions are summarised below in a preliminary statement of the pasture problem as it appears to the writer.

Three factors determine the period of growth of Mitchell grasses, viz., rainfall, temperature, and soil type, and so throughout Western Queensland we find at any particular time pasture heterogeneity corresponding with variations in these three factors.

Influence of Soil Type on Mitchell Grasses.

The Mitchell grasses grow for the most part on two types of soil, viz., the heavy soils of the "rolling downs" and the pebbly downs soils. In the central-west the two types are found alternating, but the north-west is mostly rolling downs country. Important distinctions between the vegetation on these two broad types are due probably to differences in physical properties of the soils. The distinctions are quite marked and include a larger covering of timber carried by the pebbly soils, a tardier response of the grass on the clay soils to small showers of rain, and a higher degree of palatability of the growth on the pebbly soils. The proportion of clay in the rolling downs soils is very high, and this is responsible for features such as high run-off of rain, slow and often shallow penetration of moisture, low rate of capillarity, swelling on wetting and cracking following shrinkage on drying—all features which are antagonistic to tree growth and to highest pasture production under semi-arid conditions. Though the response of the grass to showers is less on the clay downs than on the pebbly rises, during a wet season the downs are capable of yielding a heavier growth of grass than are the lighter soils.

Influence of Rainfall on Mitchell Grasses.

Of all the climatic factors whose variations are responsible for the changes in behaviour of Mitchell grasses, that of precipitation shows the highest correlation with growth characters. Variations in factors such as temperature, evaporation, and wind strength produce changes in the behaviour of the grasses, but none comparable with those induced by the vicissitudes from year to year and from season to season of rainfall.

An examination of rainfall records reveals that four divisions may be recognised in western areas. These have been classified as follows:—

(*a*) The Far-Western Division, characterised by light and erratic falls, the reliability of the rainfall being very low and evaporation high;

(*b*) The North-Western Division, experiencing the heaviest rainfall in January and February, with little winter rainfall and the rainfall period almost restricted to the summer;

(*c*) The Central-Western Division, enjoying a better distribution of summer rainfall, which occurs in less heavy falls than those of the North-West; useful autumn and winter falls are more common;

(*d*) The South-Western Division, with a somewhat lower summer rainfall, but a compensating factor in the longer rainfall period; useful winter rains often occur.

A study of rainfall tables for stations in all divisions shows significant variations in the amount recorded at each station during different years, during the seasons of the year, and during the same season in different years. Observations and inquiries concerning the influence of the annual precipitation and its seasonal distribution on growth and reproduction of Mitchell grasses have provided information regarding the growing period and productivity of Mitchell grasses in different years, the density of the stand, the lateral spread of tufts, the formation of seed, the establishment of seedlings, &c.

As a general rule the main growing period coincides with the rainy season, which ordinarily begins in December in the south-west and central-west and in January in the north-west. In certain years growth may begin with storms in October or November, or it may be delayed through lack of rain until March. In those years when the summer rainy season provides adequate and well-distributed precipitations growth continues into April. In occasional years, when temperatures are not too low, unseasonal precipitations may evoke a growth of leaves in August or September, but growth is not sustained into the growing season proper because of the very light precipitations and the severe drying winds common in October and November. Erratic falls during the summer may produce quite a substantial amount of feed if they provide abundant moisture, but heavy showers are of little use if followed by dry spells of lengthy duration. Volume production appears to be closely and positively correlated with the current summer rainfall total, though there may be a closer relation between volume production and the conditions which prevailed from the commencement of the previous summer growing season to the current seasonal conditions. If the latter is true the reason may lie in the vigour of the grass as affected by growing conditions during the previous year or more. The size of individual tufts is affected by the available moisture. Under favourable rainfall conditions the stand is maintained and improved by the building up of large tufts by a process akin to tillering. The increase in area will depend upon the vigour of the plants at the commencement of the season, as well as upon current seasonal conditions, and the thinner the stand the better the opportunity for individual plants to enlarge. Drought conditions, with the gradual depletion of the available soil moisture, cause a decrease in the size of tufts. This is effected by the centres of the large tufts dying out. Upon the return of good conditions these centres fill up slowly, but the greatest development takes place away from the periphery of the tuft, where no dead crown and root material is present to interfere with extension of growth.

Ordinarily only one flowering period occurs during a season, its advent being generally four to six weeks after the commencement of growth, provided rainfall conditions are satisfactory. Thus the flowering period may be expected in January or February and the fruiting period in March. The dissemination of seed by animals and wind begins in April and all seed is shed by the end of May or early June. One or two instances of two flowering periods in one season were mentioned, October rains producing the first and January rains the second, but a dry November is fatal to seed maturation in the early growing period. Badly distributed summer rainfall very often prevents the maturity of seed—especially in the north-west, but also to some extent in other areas—so it would appear that in general the viability of Mitchell grass seeds is fairly low, though a fair amount of viable seed is produced occasionally. Should dry years follow these good seed crops, the effect of drought at the time of germination or during the seedling stage would prevent seedlings from establishing. Only once in ten years on a property in the Maranoa have seedlings been observed.

Influence of Grazing on Mitchell Grasses.

The Mitchell grass pastures of Western Queensland, upon which millions of sheep and cattle are now raised, were developed under conditions of extremely light and intermittent grazing. Prior to settlement marsupials were the chief grazing animals, and they followed the patchy rains which produced green growth, with the result that any particular pasture area would be grazed intermittently and not continuously. With the advent of domestic animals the pastures were subjected to conditions vastly different from those to which they had become attuned, and with the upsetting of the existing balance a fresh equilibrium had to be established. In some areas a desirable balance has been reached and is being maintained; in some cases the pasture is being maintained at a higher level than before settlement; on the other hand, limited areas which once carried good pasturage are rapidly approaching desert conditions because of the stocking conditions imposed.

It is quite obvious that to maintain a good pasture it must be grazed in conformity with the requirements of the best elements (that is, the Mitchell grasses), and investigational work is necessary in order to determine the degree of utilisation of Mitchell grass pastures that will give the best economic use, and at the same time maintain a good plant cover or improve a depleted pasture. Clearly, then, there are two sides to the grazing question, and unless both sides are well considered inefficient pasture utilisation will result.

Consider first the case of a good Mitchell grass pasture which has been subjected to heavy over-grazing year after year for a number of years. Such areas occur not infrequently. The depletion of native pastures by over-grazing is a cumulative process and does not occur suddenly, but eventually the grazing capacity becomes much reduced and the vegetational cover inferior in grazing value. The cumulative effect of over-grazing (that is, trying to feed too many sheep on too few acres) is brought about by never allowing the grasses to produce a normal crop of leaf which would allow them to replenish the reserves of food stored in underground parts which have been exhausted by the continual removal of green shoots year after year. Any conditions that seriously interfere with the normal physiological processes of pasture grasses may lead to a restricted development of underground organs, and a curtailment of the storage of reserve food therein. Impairment of the vigour of Mitchell grasses by heavy and continued grazing leads to a breakdown of the stand consequent upon the weakening and death of individual plants. Increase of the surviving plants by lateral spread is hindered, natural reseeding is handicapped, and eventually the pasture comes to consist almost entirely of less useful plants.

Continuous over-grazing is undoubtedly a harmful practice, and any system of continuous grazing which each year removes the whole forage production from a pasture will sooner or later cause a decline in the grazing capacity of that pasture. On the other hand, under-utilisation of a pasture also is deleterious to the vegetation (though not to such a pronounced extent as full utilisation), permitting as it does the development of weeds and the accumulation of dead leaves and stems. It would appear from observations made that something less than full use of the forage is necessary to maintain a pasture in good condition under continuous grazing, and it is suggested that a stocking rate which in average years would leave about 20 per cent. of the vegetation unused at the end of the grazing season would give best results. During the flush period of growth very light use would be made of the pasture, and this would provide the Mitchell grasses with ample opportunity to make a vigorous growth and reproduce. In better-than-average years and in slightly dry years the under or over-utilisation would not matter much, but during years of very severe drought no system of grazing can be expected to furnish feed for the normal number of animals.

Whilst conservative continuous grazing offers one method of pasture management which takes cognisance of the requirements of the pasture plants, the short spelling of paddocks in rotation to allow of the production of a normal crop of leaf and seed would seem to offer possibilities. A number of graziers are employing this more or less definite system of grazing with good results, though it is admitted that some difficulties might be experienced in districts of erratic rainfall.

In this connection attention is drawn to the operation of the "deferred and rotation system" of grazing adopted on national forest ranges in the southern United States. As a grazing system for productive pastures its virtue lies in its physiological effect upon the pasture, since grazing is deferred and rotated over the holding to enable the plants to store up reserve food to aid in the production of the next year's crop, to allow a seed crop to mature, and to allow seedlings to establish unhampered by grazing animals.

The plan of grazing is as shown hereunder:—

Year.	Period.	Section.		
		A.	B.	C.
1936-37	Spring	////////		
	Summer		////////	
	Autumn-Winter			////////
1937-38	Spring		////////	
	Summer	////////		
	Autumn-Winter			////////
1938-39	Spring		////////	
	Summer			////////
	Autumn-Winter	////////		
1939-40	Spring			////////
	Summer		////////	
	Autumn-Winter	////////		
1940-41	Spring			////////
	Summer	////////		
	Autumn-Winter		////////	
1941-42	Spring	////////		
	Summer			////////
	Autumn-Winter		////////	

//////// indicates grazed section.

Unfortunately, the reliability of the rainfall in the west of Queensland is so low and the precipitation period so restricted that any uniform plan of rotation such as the one diagrammed seems to be out of the question. However, its basic principles—to invigorate grasses by allowing them to mature a crop of foliage, and to aid natural reseeding—might form the foundation of some method to suit Queensland conditions. If it is correct that the seeding of Mitchell grasses in most seasons is poor, the object of the grazing system might be narrowed down to provide for normal development of the useful pasture grasses in as many years as possible.

Improvement of Depleted Pastures.

There appear to have been few attempts made to restore depleted pastures to a condition of high production, and the usual method employed—exclusion of stock for a long period—has proved abortive. It should be stressed, however, that the paddocks were almost entirely denuded of Mitchell grasses before being closed to stock, and the thin stand of grass, together with a series of years inimical to seed production and seedling establishment, have militated against natural regrassing.

The density of the cover of Mitchell grasses in a pasture depends upon the number of plants and the size of the tufts, as well as upon current seasonal growth. As already stated, injudicious grazing, combined with drought, has a cumulative effect on the pasture. A pasture which has not suffered very severely may show a reduction only in the size of the tussocks of Mitchell grass, and the total number of plants of Mitchell grass may not be seriously affected. Severe pasture depletion is shown by a large decrease in Mitchell grass plant numbers (due to deaths) and a reduction in size and vigour of the remaining plants.

Owing to the gradual falling-off in productivity of a pasture it is difficult to recognise the early stages of pasture depletion by general observations of condition of the stock and luxuriance of the vegetation as a whole. The first sign of deterioration of a good pasture is shown by the impairment of the growth of the better elements, and as soon as the stand of desirable plants is weakened or opened up, annual or short-lived perennial weeds appear in the pasture, develop, and reproduce. It may not always be possible to recognise the initial stages of weakness in the Mitchell grasses, but a knowledge of the weeds indicative of slight deterioration would enable the grazier to take steps to halt the decline. For this reason the indicator plants should be determined and listed.

Slightly depleted pastures may, perhaps, be restored to full vigour and so to full productivity by allowing the Mitchell grasses to develop unhindered during a complete favourable growing period. The thickening up of the pasture by the encouragement of vegetative spread should almost completely rehabilitate a pasture showing slight depletion, but since there is always a certain proportion of plants dying from inherent causes, in occasional years the replacement of this decadent element in the pasture by new plants should be attempted. For this purpose natural reseeding is the most attractive proposition if it involves little or no spelling of the pasture, and it is probable that the seedling requirements of a dense pasture would be met by those which develop from the small amount of seed produced by a pasture under conservative grazing conditions.

The rehabilitation of a pasture which has suffered a severe diminution in the number and/or density of its most useful constituents is likely to be a slow process if natural methods, even if aided by judicious grazing, are relied upon. There would seem to be a definite need for the elaboration of some method of artificial reseeding of such areas, but how such a method, in the light of the unreliable rainfall, may be applied to our western areas, it is difficult to see. Three separate problems present themselves for solution, viz., (1) the provision of viable seed; (2) the dissemination of the seed over the pasture area; (3) the establishment and survival of seedlings.

If the evidence of seed production has been correctly interpreted, and it is a fact that the production of viable seed over most of the western areas is at a low level in most seasons, and that only in occasional years is a seed crop of any magnitude matured, then the large-scale collection of seed is an operation which may be performed only at rather long intervals. The prediction of the extent of a seed crop can have no reasonable chance of accuracy owing to the vicissitudes of climate; consequently, if seed is to be collected the individual pastoralist must be prepared to harvest a seed crop at any time during the growing season and in any year. That is to say, the necessary equipment must be on hand; it is too big a gamble to anticipate a crop. For harvesting the seed crop several methods suggest themselves. Motor or horse-drawn strippers or reapers may be employed, while for small-scale operations an American hand comb seed-stripper, as illustrated below, should prove useful.

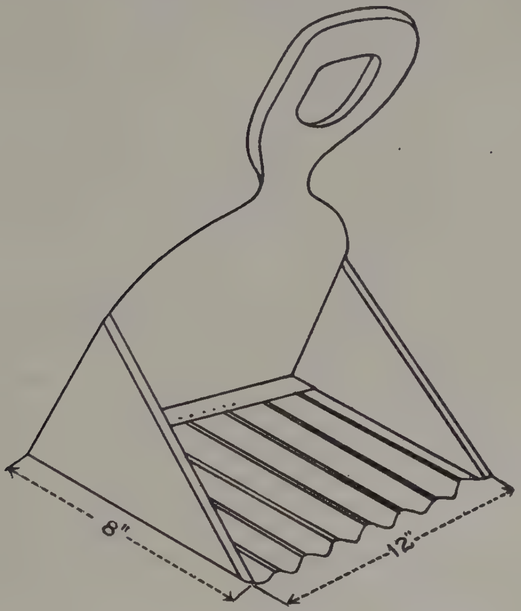


PLATE 47.

The distribution of seed over extensive areas of depleted pasture is a problem fraught with many difficulties. The cost of collection is likely to be fairly heavy, hence no extensive wastage can be countenanced. Though the physical stimuli for normal Mitchell grass seed germination are not yet known, it appears reasonable to assume that early covering of the seed after dissemination is advisable; consequently, it would seem desirable to follow any mechanical distribution with some covering agent, such as harrows or sheep, the latter trampling the seed into the ground. Just what device is used for sowing the seed will depend upon the extent of the country to be seeded, the amount of seed available, the nature of the country, &c. Sowing from an aeroplane has been advocated, but for all practical purposes, scattering from a motor vehicle should prove as useful.

Where the amount of seed available is small a method of "strip-seeding" may prove useful. A long, narrow strip of land, running across the direction of the prevailing winds, could be fenced off from stock, ploughed or well cultivated, sown with Mitchell grass seed, and the seed covered by harrowing. The favourable seed-bed conditions should induce the development of a good stand of grass, and any seed produced would be carried by wind over the adjacent area. The addition of superphosphate to these strips might possibly result in a heavier production of viable seed, and experimental work to test this point might be carried out on various soils. Where bore water of fairly good quality exists, strips might be sown along the drains and flooded periodically to keep the plants growing until the seed has matured. In windswept areas, in addition to the protected strips, a few furrows could be run across the paddocks to capture blown seed.

The period of the year at which artificial reseeding should be attempted cannot be definitely fixed, owing to the unreliable character of the rainfall, as well as to the lack of knowledge concerning the conditions essential to germination, but it may be assumed that early summer sowing would prove satisfactory if soil conditions are favourable.

The pre-treatment of seed intended for sowing, with a view to facilitating rapid germination, might yield useful results. Chemical treatments should be tried, as well as soaking in water and drying, and storage for various periods. Viability trials in the field would probably give a lead to a satisfactory treatment prior to sowing, and such trials could be carried out on small artificially denuded plots.

Even when conditions favourable to germination are provided, the percentage establishment of the seedling crop may be low because of losses from natural agencies, as well as from premature grazing. On soil packed hard by tramping, or by heavy showers of rain, the seedlings may not be able to extend their roots sufficiently to tap soil moisture reserves, and in addition packed soils allow of high surface run-off, and do not freely absorb rain. A prolonged dry period following germination causes the death of numerous seedlings, and this appears to be the chief factor militating against seedling establishment. Grazing seedlings of grasses is destructive to the plants, for those which are not pulled up by the animals may be considerably weakened by premature grazing. Consequently, when seedling growth is observed in a paddock, the stock should, if possible, be removed until the new plants have been either thoroughly established or destoyed by natural agencies.

Recommendations for Experimental Work.

With a view to the determination of the most efficient methods of grazing both good and depleted Mitchell grass pastures, and in order to ascertain the value of methods of artificial reseeding of pastures, the following trials, it is suggested, might be carried out over a number of years, viz.:—

A.—On stands of medium to high density—

1. Comparison of—
    - (*a*) Heavy over-grazing year after year;
    - (*b*) Conservative continuous grazing;
    - (*c*) Light continuous grazing;
    - (*d*) Deferred grazing.
2. Artificial reseeding.

B.—On stands which have suffered severe depletion—
  1. Comparison of—
    (*a*) Conservative continuous grazing;
    (*b*) Light continuous grazing;
    (*c*) Deferred grazing;
    (*d*) Long spelling.
  2. Artificial reseeding.

The first consideration in experimental work of the nature outlined is a measure of efficiency of a grazing practice or other system of management, and such a measure must include all the factors concerned. The aim on most of the western areas is to produce wool, though during critical drought periods this object may become subservient to the effort to keep the sheep alive and in fair condition. However, for the purpose of the experiments, the wool production per head or per acre may be regarded as one of the main factors. As there may not be a high positive correlation between weight gains and wool production, the live-weight increments or losses of the stock will need to be measured. In addition, there is the effect of the grazing on the pasture to be considered.

Based on a United States measure of efficiency, the following measure is formulated:—The most efficient system of grazing is one that will ensure sufficient forage during the entire year to produce the greatest total gain (in wool and/or body weight) with the least number of sheep on the minimum unit of land, without permanent injury to a good stand of grass, and with definite improvement (with the minimum disturbance and loss in forage use during the revegetational period) to depleted pastures.

The measurements required are gains per head and per acre and pasture changes. With regard to measurements of pasture values, volume production, and nutrient value of the pasture as a whole will be measured to some extent by animal gains, but precise information on these points can be obtained only by intensive study of the vegetation itself. In addition, changes in vegetation must be noted in detail. Although to trace changes in botanical composition of the pasture periodic examination of plots selected at random at each inspection is sufficient, to follow the effects of different systems and intensities of grazing on individual plants (which is highly desirable), small permanent plots are essential, and such permanent plots could be designed to serve for botanical studies of the pasture as a whole, as well as of individual plants.

For sequential studies of vegetation, permanent plots are essential, and while a permanent narrow belt traversing the experimental plot could be utilised, it is thought that a much more convenient method would be to scatter permanent small square plots or quadrats over the trial areas. Such quadrats, each one square metre in area, would require to be properly marked by metallic pegs and, perhaps, located by means of painted wooden stakes.

Various methods of examination of quadrats could be employed, depending upon the purpose of the analysis.

Mapped quadrats, in which ordinarily all the vegetation within the quadrat plot is mapped on a chart in its actual position, are valuable for recording changes in individual plants, but much tedious work is involved, and for this reason mapped quadrats are unsuitable for determining changes in the vegetation of a large plot as a unit. Individual plant studies are conveniently conducted by mapping or charting, of which three variations are in use, viz., freehand charting, pantograph charting, and camera charting.

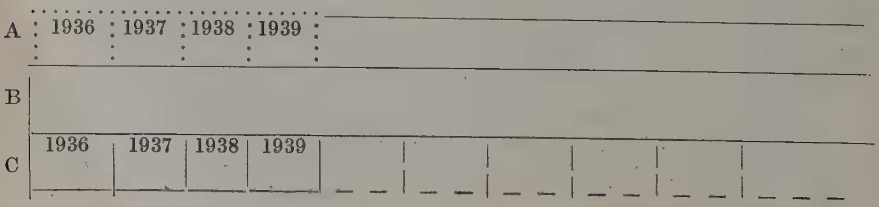
In freehand charting the relative position of each individual plant within the quadrat is marked on a square chart. Usually the ground cover of each plant is indicated. For reproducing the outlines of tufts the pantograph is claimed to be speedy and reliable. An instrument set to reduce to 1/3·75 would require a map of 10·5 inches square for charting a metre quadrat. Two persons are, however, required for charting with a pantograph.

A camera method of charting quadrats has recently been developed in Africa, in which the camera is focussed over the quadrat, and the image of the vegetation is traced on a sheet of oiled paper attached to a sheet of plain glass substituted for the frosted focussing glass.

For accurate botanical analysis of a pasture a fairly large number of sample plots must be examined, and charting in position is too slow. The usual listing method, which consists in noting the number of plants of each species in a quadrat, is hardly suitable for grazing studies in which ground cover of individual species is of considerable importance, and a method combining charting and listing is of greater value. In this method the quadrat and the map are both divided into a number of equal-sized segments, and on the appropriate division of the map are recorded not the number of individual plants of each species, but the percentage of ground cover formed in the corresponding unit of the quadrat by the different species, and the density of cover within that unit. The mapping is quickly done and the records easily summarised.

Clipped quadrats have been used to furnish a record of the volume production of forage by pastures, but the action of clipping is different from that of grazing in many respects, notably—(1) The vegetation is cut uniformly at a given height; (2) the natural preferences of live stock are not copied; (3) the trampling action of live stock is absent; (4) no nutrients are returned to the soil as animal excrement. While the forage produced under different grazing methods cannot be accurately determined by clipping, the use of clipped quadrats may show a number of points, such as relation of yield to soil moisture, relation of plant cover to soil moisture, relation of height growth to yield, relation of nutritive values to soil moisture, &c.

Isolation transects, which are really experimental plots within experimental plots, have proved useful in the United States of America in semi-arid pasture investigation. Within an experimental plot (which is usually some acres in extent) an area 300 feet long and 60 feet wide is pegged out and divided into three long sections each 20 feet wide, and each section is subdivided into units 20 feet square. The following diagram illustrates such a transect:—



The three series A, B, and C are designated as grazing series, permanent series, and regeneration series, respectively. At the commencement of the experiment, sections A and B are fenced and section C is unfenced. One of the units in series A is opened to grazing each year (the dotted lines indicate where fences will have been removed each year). Series B is not subject to grazing or cutting at any time. One unit of series C is closed to grazing each year (the dashes indicate where fences will subsequently be erected).

The isolation transect allows of intensive study during a period of years of small plots grazed for various periods following spelling for various times, of other plots spelled for different periods after grazing for different periods, and of comparison of such plots with plots totally protected from grazing.

Acknowledgments.

The writer desires to acknowledge, with thanks, the very material assistance and the useful information provided by pastoralists throughout Western Queensland, by the United Graziers' Association of Queensland, by the Selectors' Association of Queensland, and by Mr. J. E. Thomas. In drawing up suggestions for future experimental work free use has been made of technical reports and other matter prepared by pasture workers in the United States of America and in Africa.

Plate 48.
A view of the Mulgrave River at Deeral, the Bellenden Ker Range forming the background.

Agricultural Notes

THE good rains received during January have completely altered the outlook throughout the agricultural and dairying districts of the State. Pastures and young growing crops have responded to the favourable conditions and present a pleasing picture, while farmers are now able to proceed with the preparation of land for autumn-sown crops under ideal conditions.

Wheat.

Under Queensland's climatic conditions it is imperative for all wheatgrowers to work the land as soon as possible after harvest and maintain the fallow in good condition until seeding time. This practice is now becoming general, as previous dry seasons have demonstrated the value of ample subsoil moisture reserves in facilitating the seasonal sowing of the crop and enabling the young plants to make normal growth without substantial winter rains.

During the present month the State Wheat Board will endeavour to finalise the payment of a second advance on the recently harvested crop, amounting to 1s. per bushel. The rise in world wheat prices is very encouraging, and if it can be maintained will compensate for the lighter yields received by the majority of growers. Given favourable conditions until sowing it is safe to anticipate an increased area being placed under crop during the coming autumn, resulting in a heavy demand for seed wheat.

Tobacco.

January rains have completely altered the outlook in the tobacco industry, and given fair conditions from now on splendid returns should be secured in the majority of districts.

The good stands obtained in the Texas and Miriam Vale areas have received the necessary impetus to ensure the harvesting of ideal crops.

Curing has commenced at Texas and this will be closely followed by growers at Miriam Vale.

In the Northern areas early planted crops should receive the necessary assistance to tide them over until curing commences, while general planting has been carried out under ideal conditions.

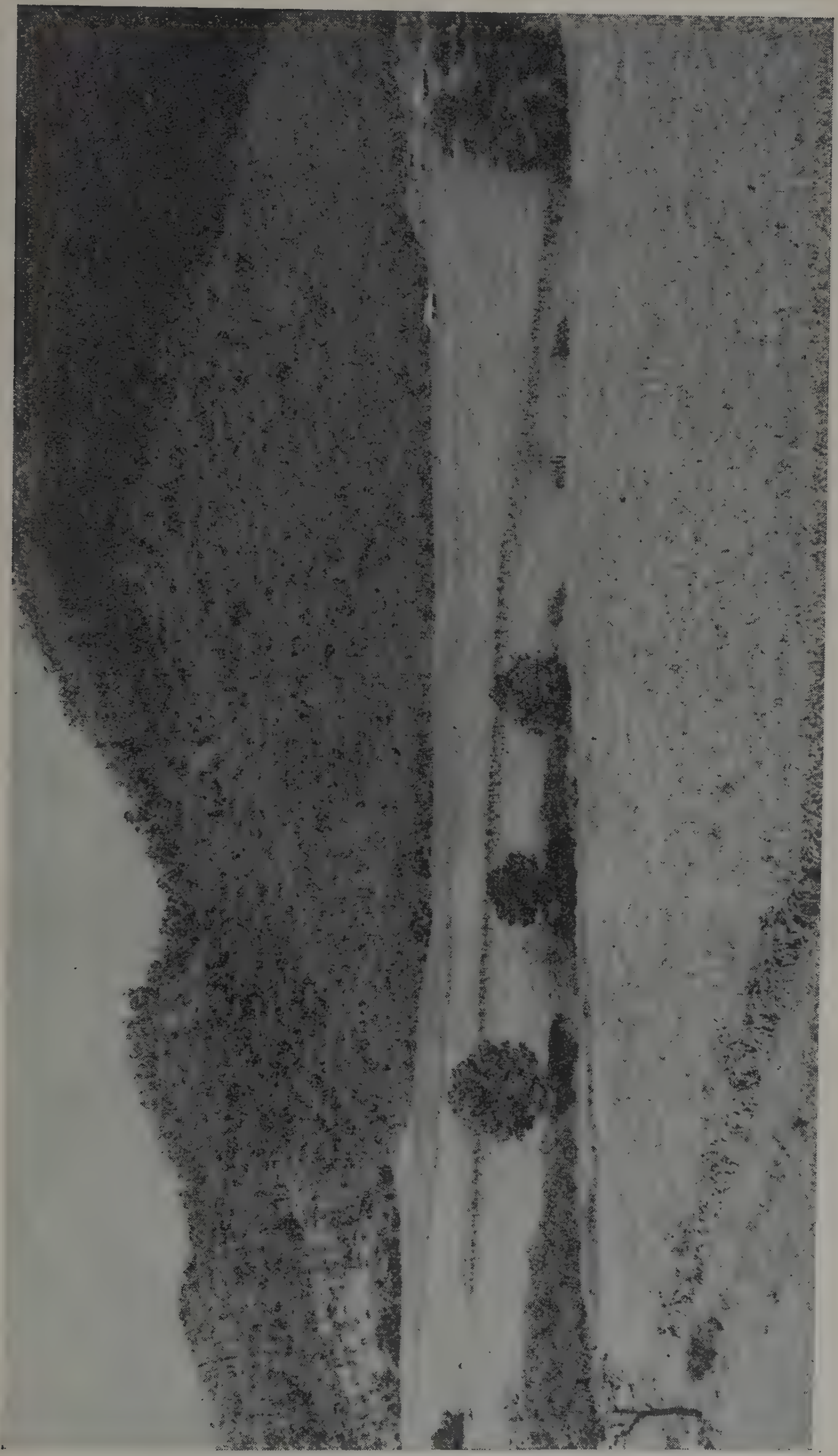


Plate 49.

Rich cane lands sheltered by forested foothills of the Bellenden Ker Range, near Cairns, North Queensland.

[Photo. by courtesy Telegraph Newspaper Co. Ltd.

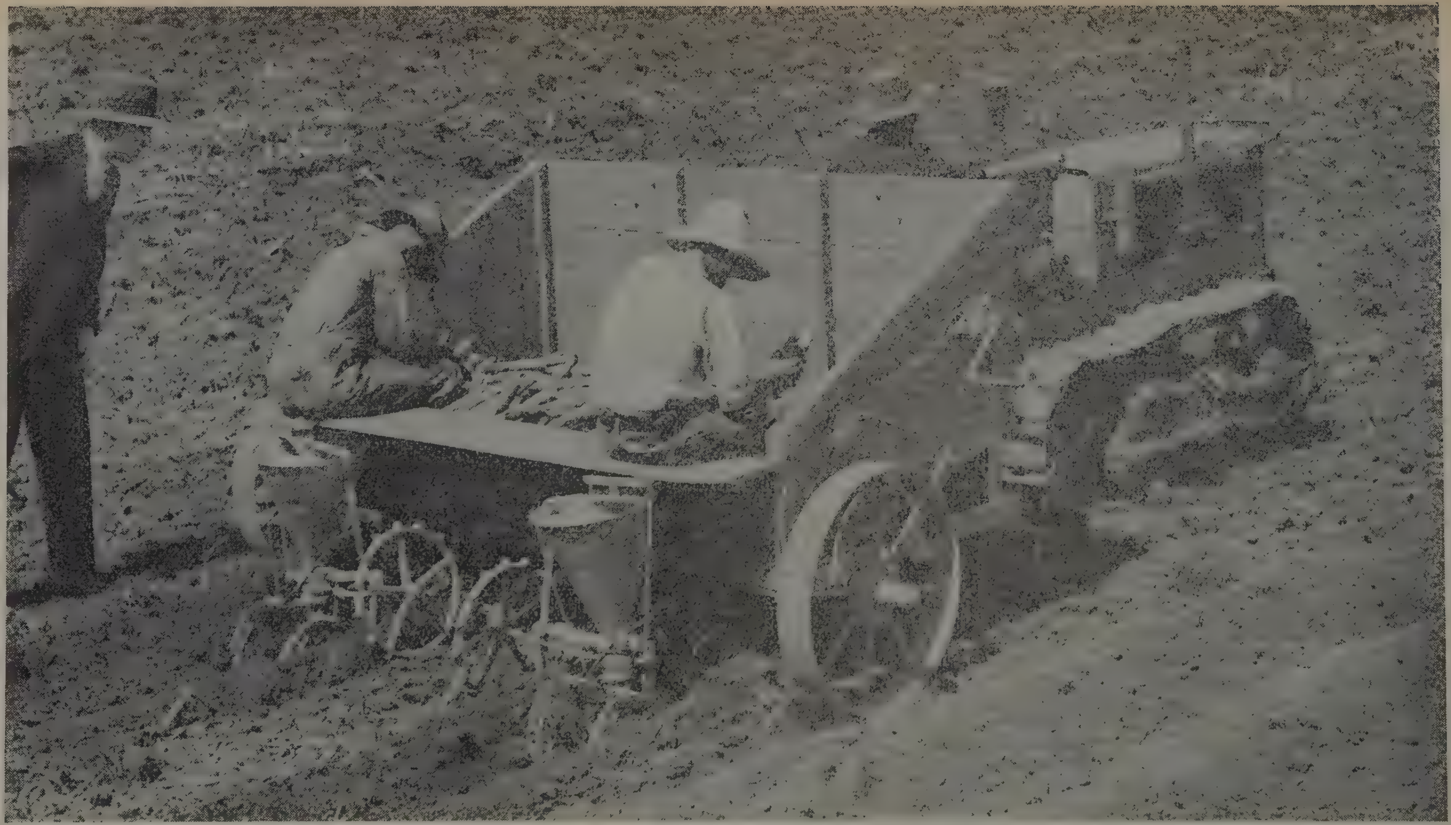


PLATE 50.
Planting cane near Mackay.

[Photo. by courtesy Telegraph Newspaper Co. Ltd.

Sugar-cane.

Beneficial rains were experienced in all cane areas during January, and although in certain districts the falls were heavy, in the aggregate no flooding resulted. With the high atmospheric temperatures which have prevailed rapid crop growth has been recorded.

At the present time the southern areas would benefit from further rains, but in all prospects for the 1935 crop are particularly bright.

General.

Approximately 14,000 acres have been sown to peanuts, being a considerable increase on last year's total of 10,500 acres. The early-sown crops are making rapid progress, but owing to the dry conditions experienced during November and early in December a large area was not placed under until January, which fact renders it liable to suffer damage if early frosts are experienced.

A steady development in the breeding of draught horses is now taking place throughout the Commonwealth, having been encouraged by the lower prices received for primary produce during recent years and the resultant necessity for economy and the local production of farm power. The horse is recognised as an economical and efficient power unit and is necessary even on the more extensive areas where tractors provide power for the main cultural and harvesting work. High prices are now readily obtainable for good quality draught horses, as indicated by the record figure of £90 per head paid for the four New Zealand-bred geldings which formed the champion team at the Melbourne Centenary Show.

Owing to the indifferent results obtained from the early established potato crop, it is expected that the main February planting will be unusually heavy. For late planting whole seed is preferred, as cut sets are liable to rot if warm moist weather is experienced. Seed treatment with hot formalin is recommended as a control of seed-borne disease, using 1 pint of commercial (40 per cent.) formalin to 15 gallons of water. The solution is heated to 125 degrees Fahr. and kept at this temperature during treatment, the tubers being immersed for two and a-half minutes. Cover with bags or canvas for an hour to retain the formalin fumes, then spread out to dry before planting.

◆

EXPIRED SUBSCRIPTIONS.

A very large number of subscriptions to the Journal expired in January, and have not been renewed. A further large number expires with this issue.

Subscribers whose term has expired have been continued on our mailing list, and a yellow wrapper on this month's Journal (February) is an indication that their subscriptions are now due.

Address renewals without delay to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Lucerne Cultivation.

LUCERNE requires three essentials—heat, moisture, and calcareous soil of a sufficient depth. Given these, lucerne will flourish and produce heavy crops over a number of years. Light, sandy soils are not suitable; in fact, better results, comparatively, are obtained from the heavy soils of basaltic origin.

Where lucerne has ample sub-surface moisture or where its roots can penetrate into sub-surface soils similar to those which are found on alluvial flats it flourishes to perfection. Land intended for lucerne is best cropped with a cereal prior to its preparation for lucerne. Wheat, oats, barley, rye, panicums, and millets are suitable for this purpose, as ample time is available between the harvesting of one crop and the sowing of the lucerne.

Stubbles should be cultivated to induce volunteer growths of weeds and other seeds; these should be turned in subsequently, preferably by ploughing. Two deep ploughings should be given at right angles to each other as a sort of initial cultivation. Moisture should be conserved by frequent cultivation.

It may be necessary, in order to improve the tilth of the land, to carry out another light ploughing before the period of sowing, but if this is necessary cultivators and harrows must be used freely in order to reduce the tilth to that which is usually associated with an onion bed. Twelve to 14 lb. is ample for sowing, provided a drill is used and the lucerne is distributed from what is known as a grass seed box.

Where lucerne is being established as a nut grass preventive it is advisable to drill at right angles, using half the quantity of seed each way, which for the purpose should be increased to 20 lb. per acre. Lucerne is often sown over a lightly-rolled surface, and if this system is adopted one very light harrowing will be sufficient to give it a covering.

Lucerne germinates in from five to nine days, according to the soil moisture which is present. After the appearance of the first leaf its progress appears to be checked; this is due to the young root system becoming established, and fully a month or six weeks will have passed before the young plant is fit for its preliminary cutting by the mower. In no circumstances should young lucerne be permitted to flower; this only brings about a weakening of the plant, and causes a drain on its vegetable system which will show its effects later on.

An early mowing acts as a pruning and stimulates the root growth. The result of the first cutting may not be worth gathering, but it is best to give the lucerne a light harrowing after the crop has been cut. A second cutting may be obtained in from three to five weeks, provided weather is suitable, and the plant should not be allowed to show too much flower, say 10 per cent., before being cut.

When dry weather sets in and cracks appear in heavy soils, cutting should be followed by immediate cultivation and efforts made to conserve all subsurface moisture possible. Hay making with lucerne requires considerable knowledge of the plant and also local climatic conditions before you can claim to be an expert at curing lucerne hay.

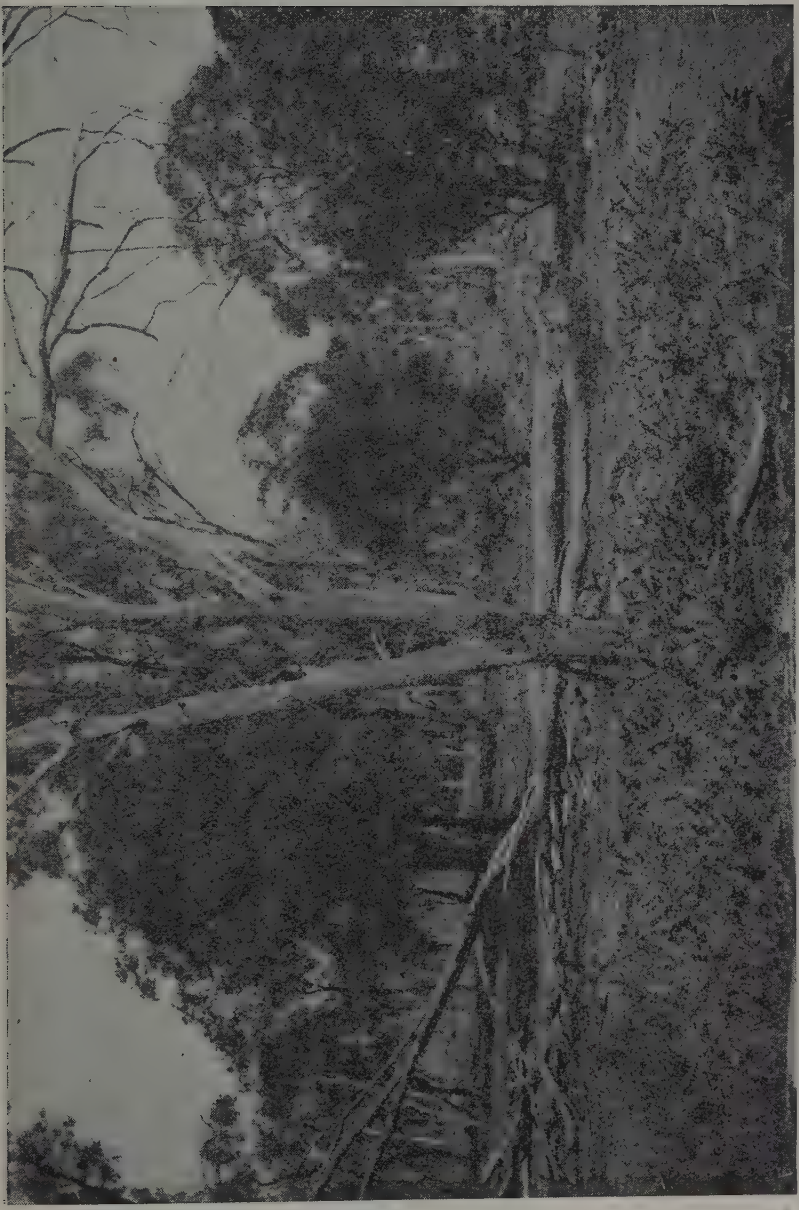


PLATE 51.

Bushland infested with Tiger Pear. Now cleared by employees of the Prickly-pear Commission, equipped with atomizers for poisoning the pest.

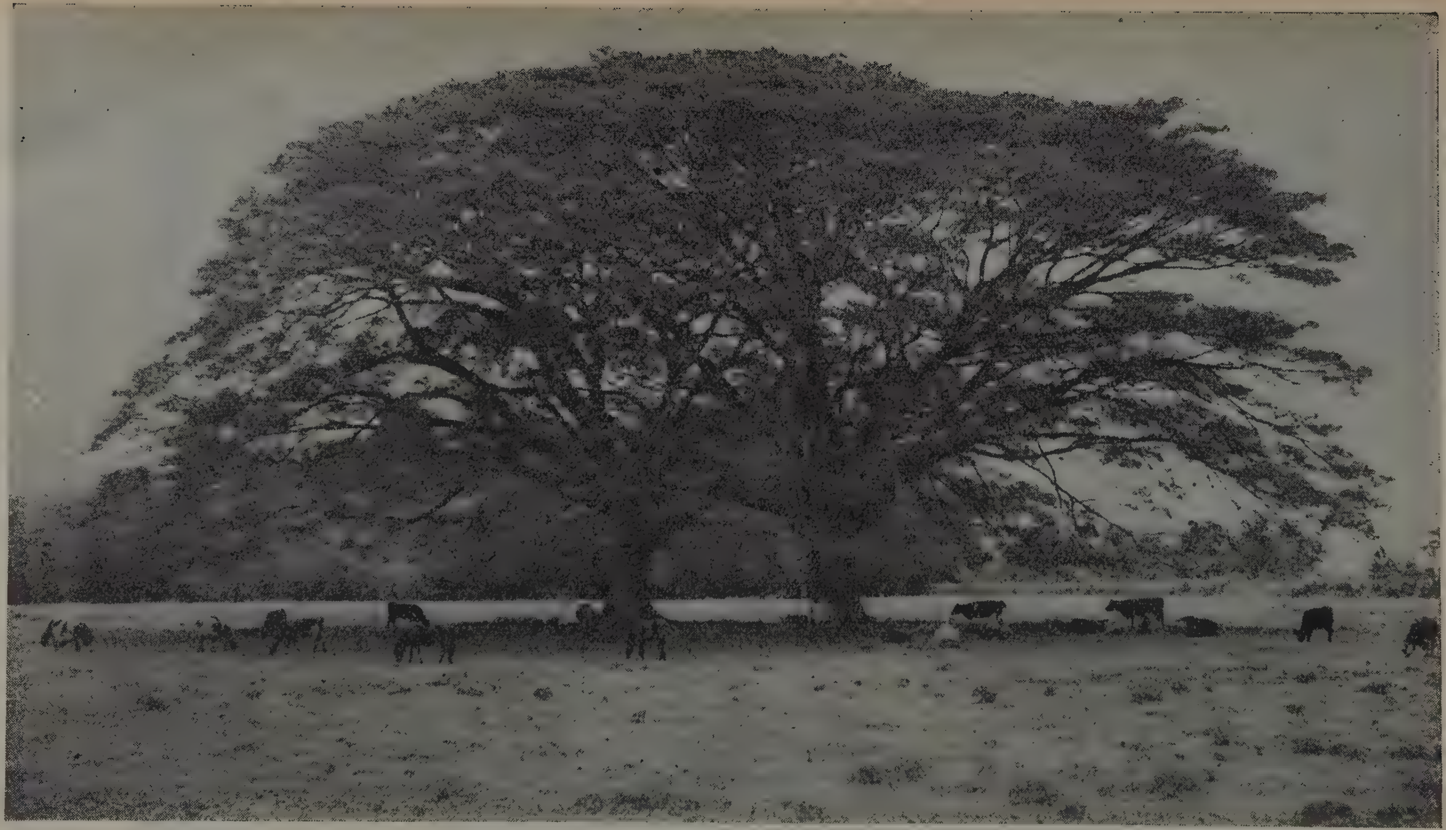


PLATE 52.

Park-like country at Macknade, near Ingham, North Queensland.

[*Photo. by courtesy Telegraph Newspaper Co. Ltd.*

Perfect lucerne hay contains only 25 per cent. of its original moisture, and has retained its leaf and colour and is soft and palatable to stock.

The only pest that has so far proved itself a serious menace to lucerne growing is the lucerne moth, the larvæ of which spin their cocoons at the terminals of the plant and so limit their growth. Frequent cutting of the plant when this pest is present will control it.

Dodder, the parasitical plant, is more likely to prove troublesome than insects or fungus diseases. This is easily distinguishable by its threadlike vine and golden yellow colour. The surest way of destroying dodder is to chip the plants to the crown, or straw should be carted on to the patches and burnt. Burning is the safest remedy, and if not carried out too drastically will not injure lucerne plants to any extent.

A good rainfall cannot always be depended upon at seeding time, and light falls of rain may have the effect of germinating the seed without being sufficient for further growth. For dry districts, therefore, fallowing is essential, and the land should be ploughed in autumn or early winter the year before it is intended to sow the seed. The depth of the ploughing is governed by the character of the soil. Alluvial soils should be ploughed to a depth of about 7 inches, but on other classes of soil of lighter or more porous nature a depth of 4 or 5 inches is sufficient.

The ploughed land should then be allowed to lie in the rough state for a month or so and be broken down in the beginning of summer with harrows. During the summer months the land must be frequently worked with harrow or cultivator, so as to allow neither growth of weeds nor the formation of a hard crust on top. If the seed-bed cannot be worked down sufficiently fine with the harrows a one-way disc cultivator or roller will soon do all that is necessary. If the land is rolled it should be harrowed immediately after the rolling.

Success in establishing lucerne in dry districts depends almost entirely upon the thorough preparation of the soil, and the ideal conditions to be aimed at are a well-worked soil, in which the previous year's rainfall has been conserved, together with a reasonably finely worked surface mulch.

About a month before the seed is sown a light ploughing or disc cultivation should be given, and immediately prior to sowing the land should be well harrowed, and. if necessary, rolled to level the surface and give a firm, fine seed-bed. Generally, about three or four harrowings and one good rolling are required on alluvial soil, but it may be necessary to roll twice. If weeds or grass are still present they should be worked out with a springtooth cultivator and removed. Lighter soils can be brought into condition with considerably less working.

Since the surface soil undergoes the greatest change it follows that it becomes the most fertile, and it is necessary to retain it where the young plants will be benefited by the enhanced fertility. The seed is planted near the surface, and it is there that the young roots gain the sustenance required by the plant. If deep ploughing is given the second time, this improved soil is inverted and put beyond the range of the young roots. The second ploughing should, therefore, be shallow.

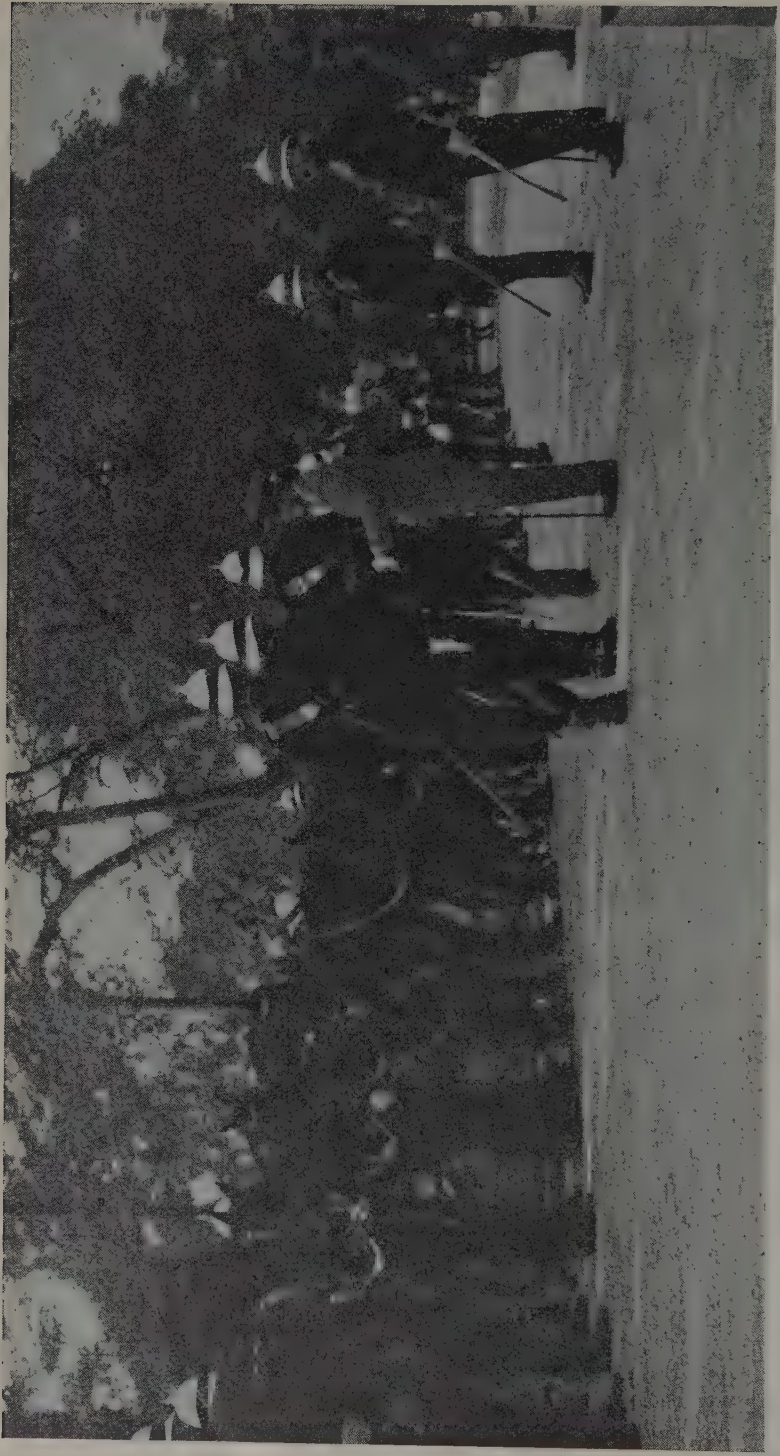


PLATE 53.

King Edward VIII. thanking informally his police escort at Parliament House, when, as Prince of Wales, he visited Brisbane in July, 1920.

Skeleton Weed.

Danger of Introduction to Farming Areas in Queensland.

SKELETON weed (*Chondrilla juncea*) has become a serious pest of the wheat areas in New South Wales in recent years, where it has been responsible for drastically reducing yields and in some instances of rendering lands totally unsuitable for farming purposes. As there is a distinct possibility of introducing ''skelton weed'' to this State per medium of the normal purchases of New South Wales wheat, farmers are advised to give attention to the immediate eradication of isolated plants which may appear in the paddocks.

The recently harvested Queensland wheat crop of approximately 3,000,000 bushels will be inadequate for the State's requirements, and as the bulk of the wheat consists of sound milling grain it is certain that a large proportion of the grain required for feed purposes will be drawn from New South Wales supplies of F.A.Q. wheat. The following note which appeared in the January, 1936, issue of the ''Agricultural Gazette'' of New South Wales is therefore particularly opportune:—

BEWARE OF SKELETON WEED.

The Seed may be in Chick Wheat.

The danger of spreading skeleton weed per medium of wheat supplied to poultry farmers, both in poultry farming districts and throughout country districts generally, has recently been brought under notice by the discovery of numerous seeds of the weed in samples of wheat obtained from stores.

Poultry farmers should, therefore, keep a sharp lookout for weed material resembling lettuce seed heads, or like the heads of the common milk thistle, and having a greyish appearance, in samples of chick wheat. Should the wheat have come from the Riverina there is a big chance of skeleton weed seed being present in quantity, and this will almost certainly lead to the establishment of the weed in the vicinity of the fowl pens, &c.

Special precautions should be taken to prevent any such material being fed to horses, for the seeds of skeleton weed can pass unharmed through the digestive tract of these animals and thus be distributed upon cultivation land in horse manure.

Skeleton seed can be dealt with if steps are taken early enough. To enable this to be done, it is obviously necessary for land holders to recognise the weed and take vigorous action to prevent the plants reaching maturity.

* * *

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Horticultural
Notes

CITRUS NOTES.

By R. L. PREST.

IN orchards where unprofitable trees have been cut back preparatory to budding over with selected varieties, the thinning of new growths may be completed, leaving two well-grown shoots suitably placed near the end of the shortened arms. When the new shoots have attained some ⅜ inch in diameter and the sap is flowing freely, budding may be commenced.

When the shoot is ready to receive the bud a perpendicular cut is made in the bark in some suitable position near the base of the shoot from 1 to 1½ inch long through to the cambium layer. Another cut is made across the perpendicular one. The two cuts when made appear thus—T.

Budwood should only be taken from selected trees which are healthy and noted for their consistent production of heavy crops of quality fruit. Such budwood should be chosen from well-rounded, mature wood about the thickness of a lead pencil and not more than one year old. Before the buds are cut from the budstick, the leaves are trimmed off, a piece of the leaf stalk or petiole being left, and by this means the bud can be more easily handled after cutting. The buds may be cut off the stick upwards or downwards. The general practice is to cut from below the bud up, starting about ½-inch below the bud, ending about ½-inch above.

The cut should be made with a sharp thin-bladed knife, cutting just deep enough to remove a very thin layer of wood. The wood may be carefully removed from behind the bud, care being taken not to damage it. The bud is then inserted down and under the bark by raising the latter with the budding knife. In order to bring the bud and stock in close contact they are bound tightly together with a raffia tie. In two or three weeks the bud, if it remains green, will have taken. The tie should then be cut to prevent throttling. When the budding has been done in the autumn it is better to leave the shoots as they are until the following spring, when growth may be started by removing a portion of the top of the shoot to within 3 or 4 inches of the bud, the stub being utilised to tie the bud to until it is strong enough to support itself. The stub may then be removed by a sloping cut from just above the bud.

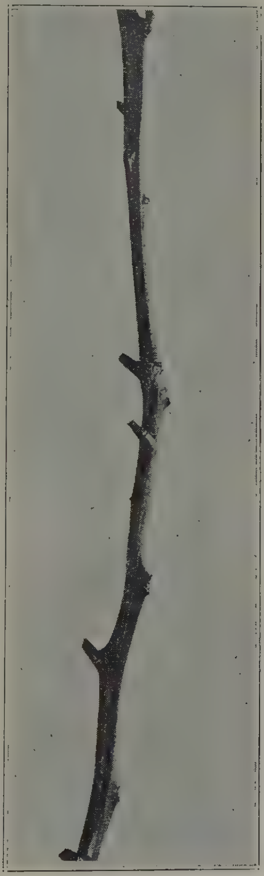

Plate 54.

Budstick showing two periods of growth. The joint is plainly seen, indicating where the previous growth terminated and the last growth commenced. The last growth is discarded as the buds are somewhat immature, whilst those at the base of the previous growth are flat and likely to be blind, and therefore unsuitable. Those in the middle are full and well developed and ready to use.

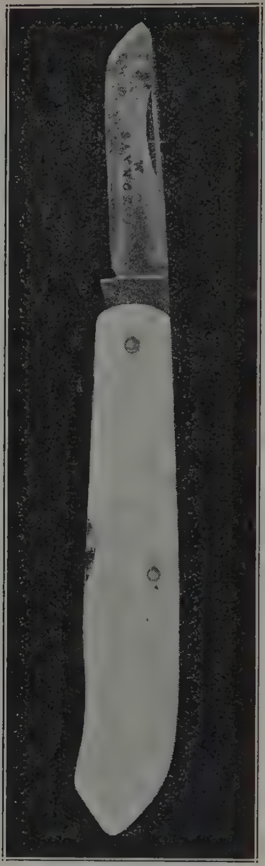

Plate 55.
Suitable type of budding knife.

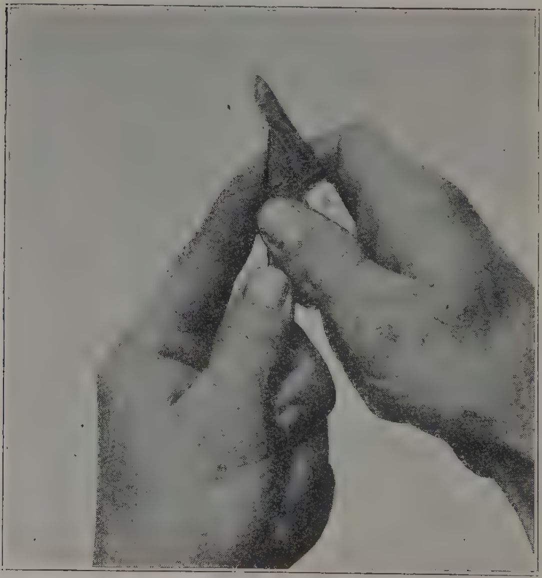

Plate 56.
Method of holding budstick and of cutting the bud from below the bud up in the case of citrus.

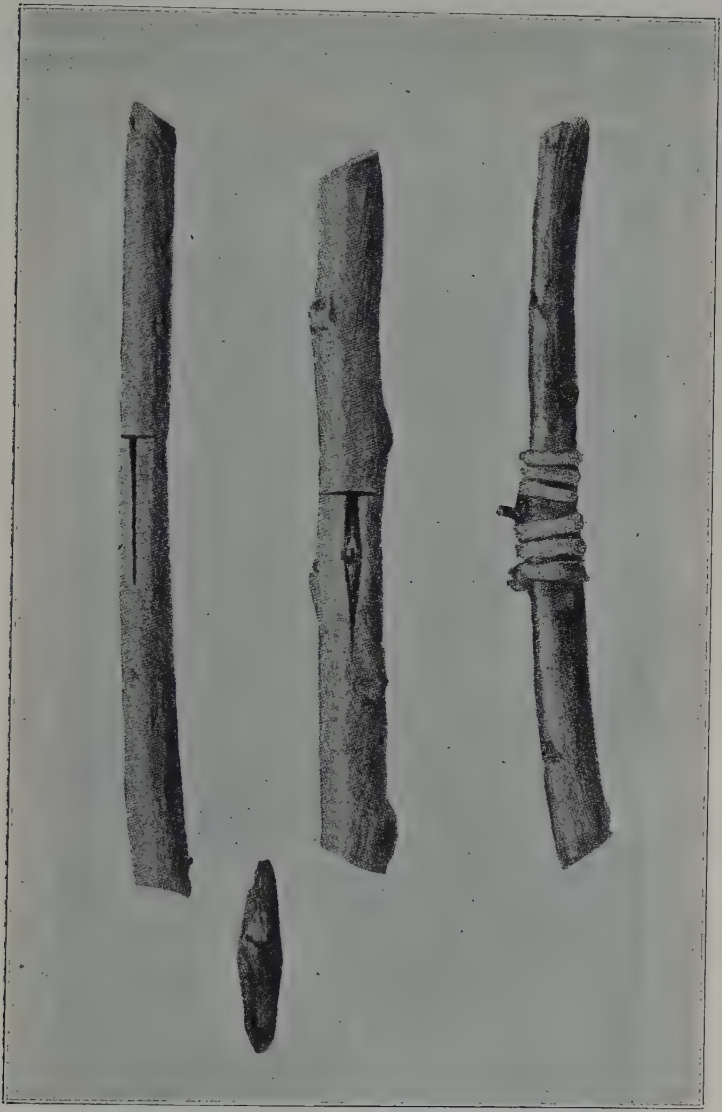

Plate 57.

Fig. 1.—T-shaped cut in stock. Fig. 2.—Well-developed bud cut ready for insertion. Fig. 3.—The bud in position. Fig. 4.—Method of tying.

SOME TROPICAL FRUITS.

No. 6—THE WAMPEE.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

ISOLATED trees of this fruit are to be met with in gardens around Cairns, but it is by no means a common fruit tree in Queensland, and is quite unknown to most people.

The Wampee is a native of the Orient, probably of South-eastern China, and in parts of that country it appears to be quite a common garden tree.

It is known botanically as *Clausena lansium, Clausena wampi,* or *Cookia punctata,* and is a member of the order Rutaceæ.

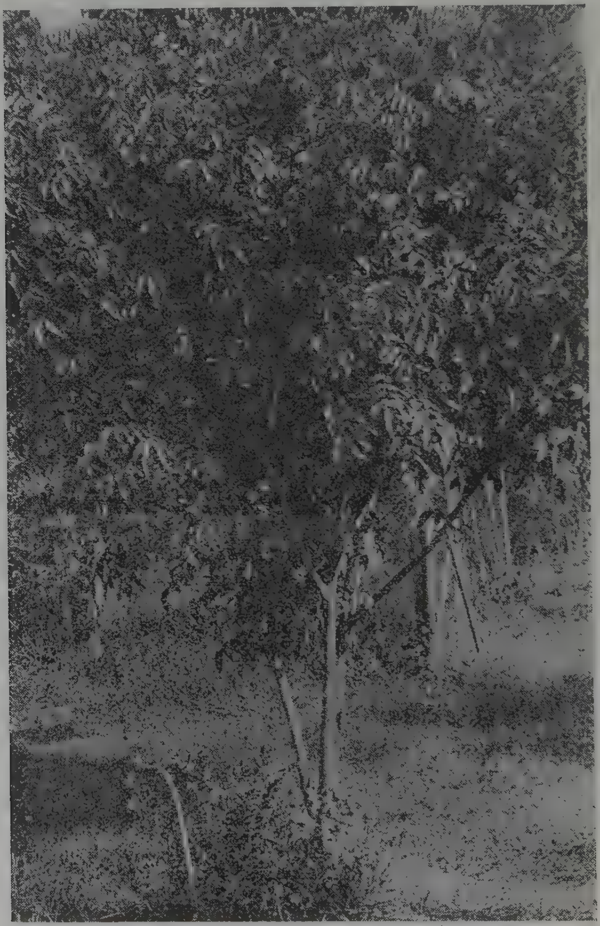

PLATE 58.
A seven-years-old Wampee Tree.

The tree is a fairly quick, upright growing one, with dense, dark green foliage. A characteristic is the long, upright branches, which are extremely flexible. The bark is grey-brown in colour and very raspy to the touch. The leaves are compound and consist of nine to thirteen leaflets placed in pairs almost opposite and with one terminal leaflet, on a common petiole 7 to 9 inches long. The leaflets are ovate-lanceolate from 2 to 5 inches long, the length of each pair between the base and terminal being progressively greater than that of the preceding pair.

Plate 59.
The Wampee. Illustrating the fruiting habit.

The flowers are small and carried on green, raspy panicles arising from the terminal and sometimes three or four preceding axillary buds of the branches. The panicles may set and carry to maturity anything from six to eight up to about eighty fruit. Well-grown specimens of fruit attain to a size of about an inch in diameter. When young the fruit is deep-green in colour, and as it grows it gradually changes through light-green to yellow as it approaches maturity. This in turn changes to light-brown and finally to dark-brown as the fruit becomes over-ripe.

The skin is slightly pubescent and raspy, and is thin. The flesh or aril is clear, jelly-like and juicy, and slightly acid in flavour.

Enveloped in the flesh are the seeds, one to five in number. These are flat and oval in shape, about one-half inch long by one-quarter inch broad. About one-third of the seed at the upper or broad end is of dark-brown colour and the remaining two-thirds bright-green.

The tree is usually raised from seed, which germinate readily in a few days. Experiments in vegetative propagation have been carried out in the Philippines, where P. J. Wester has found that the tree may be shield-budded. He recommends the use of scarcely ripened, petioled budwood, from which a shield 1½ inches to 2 inches long should be cut. He states that the age of the stock at the point of insertion of the bud is unimportant.

This fruit is tropical in its requirements and thrives best on a rich well-drained soil. Plenty of moisture is needed to obtain good results. Light dressings of fowl manure are beneficial, both to the growth of the tree and the size of the fruit. The seedling tree will commence to bear at five or six years of age. In the Cairns district the tree blooms during July and August and the crop ripens in November and December. Both the fruit and the crushed leaves have a strong and distinctive scent, similar to that of a Brazilian Cherry.

The fruit is eaten fresh or may be made into jam or jelly. The jelly has a pleasing flavour, slightly acid and very distinctive. It is made similarly to grape jelly.

The Chinese, who are very partial to the fruit, have a method of preparation involving salting-down for about forty-eight hours, and they claim that fruit so treated has a better flavour than the fresh fruit and has the added advantage that it will keep longer.

FRUIT INDUSTRY IN NORTH QUEENSLAND.

QUARTERLY REPORT.

Mr. S. E. Stephens, Instructor in Fruit Culture, reports:—

IN the Cairns district the quarter ended 31st December, 1935, produced favourable weather conditions for the growth of the various crops. Other portions of the Northern area were not so fortunate, however, conditions in Townsville being almost disastrous.

In Cairns the rainfall recorded was 547 points in October, 291 in November, and 62 in December, which fell on eleven, thirteen, and two wet days, respectively.

Coastal centres visited during the quarter were Mossman, Port Douglas, Cairns, Babinda, Innisfail, Cardwell, Rollingstone, and Townsville. Tableland centres were Atherton, Herberton, Evelyn, and Ravenshoe.

Citrus.

Orchards throughout the North were found to be in reasonably healthy condition. In coastal orchards the cultivation frequently left much to be desired, whilst pruning throughout is very haphazard.

Trees throughout the Northern district carried a small late crop of fruit, which was harvested in the early part of the quarter.

The crop of oranges, mandarins, and lemons which set early in the quarter is developing well, and gives promise of a very fair harvest.

During December harvesting of the new season's lemon crop commenced in the Cairns district. The fruit being of good quality and the market under-supplied, these found a ready sale in an uncured state.

A small quantity of new season Naval oranges, fit for marketing, have been noticed in the Cairns area during the last fortnight of the quarter.

Pineapples.

Probably owing to the dry and hot conditions the pineapple crop in most parts of North Queensland matured rapidly and harvesting extended over a short period only. The Magnetic Island harvest lasted for approximately four weeks and was practically completed by mid-December. In Rollingstone district harvesting commenced in late November and will now be almost over. The Cairns season commenced in late October and extended to Christmas. The crop was a good deal lighter than that harvested last year. The size still continues small, even in young areas, most of which have been planted on used land without any addition of fertilizer. The industry in Cairns is in the hands of Chinese, who cannot be persuaded of the benefit to be obtained from feeding the crop.

Bananas.

The banana industry is now so restricted that some Northern centres have found it necessary to purchase supplies of fruit from the South. Planting during the year 1935 shows an increase over 1934, the figures being 33 acres in 1935 against 18 acres in 1934. There is room for further expansion to meet local demands. The general quality of fruit marketed is still very poor.

Mangoes.

The mango crop this year was fair, but in most districts the fruit was somewhat below normal size. This was particularly noticeable in the Magnetic Island area, where total absence of rain since the setting of the fruit adversely affected its growth.

Cairns district, on the other hand, had fair spring rains and the mangoes were up to the average in size.

The search for good mangoes in the North has been continued and has produced several trees of good quality, from which it is hoped to carry out propagation work.

Papaws.

These were in fairly plentiful supply and were of excellent quality. Several plantings of young trees have been made around Cairns during recent months.

Litchis.

The promise of a good crop mentioned in last report was not materialised. Only odd trees carried fruit. What fruit there was, however, was of good quality, and was selling in local shops at 3s. 6d. per lb.

Avocados.

A number of trees throughout the Northern district are carrying fruit this season.

Miscellaneous Tropical Fruits.

Sugar Apples, where pruned and cultivated, are carrying good crops of fruit, which is developing well. On neglected trees the fruit is generally somewhat stunted.

Wampees have carried heavy crops which are now almost finished.

The Cashew is ripening its crop.

Breadfruit, Jack fruit, Mabolo, Carambola are all carrying crops.

Several other tropical fruits are blooming.

Temperate Fruits.

The grape crop in the Tableland districts is generally good.

The plum crop is good, but rather late on account of a late frost having cut the first crop of blooms, causing the trees to throw a second crop, which set well and ripened during December. Fruit Fly became prevalent towards the end of the month.

Persimmons are carrying a heavy crop.

Tung Oil.

Trees in the Queensland Forest plantations in the Innisfail district bloomed during the quarter and have set a better crop than was obtained last year.

* * *

PINEAPPLE-GROWING IN HAWAIIAN ISLANDS.

By JOHN DUTHIE.

Mr. John Duthie, Manager of the State Cannery, Brisbane, visited Hawaii recently to investigate canning methods. In the course of his three weeks' stay in the Islands, he took the opportunity of looking into production methods, and has kindly supplied the following notes concerning his investigations.

PINEAPPLES are grown on the following Hawaiian Islands:—

	Acres.
Oahu	43,000
Molakai	12,000
Maui	15,000
Lanai	18,000
Kauai	5,000
	93,000 acres ap.

The rainfall varies between 10 and 100 inches per year, average about 50 inches per year. It rains mostly at night, good steady rain. There are distinct dry areas on the different islands and trial plantings, rain registrations, and soil analysis are first made by the Association of Hawaiian Pineapple Canners, University of Hawaii, Honolulu. In some instances only 10 inches of rain per year may be registered but they get heavy dews, which with the use of paper mulch would give the plant the necessary moisture.

The temperature varies between 70 and 90 degrees.

Pineapples are grown from 900 to 3,000 feet above sea level. Sugar cane is grown on the lower levels where irrigation is practicable. Pineapple plantations on the Island of Oahu are situated near Kipapa, 20 miles from Honolulu. These plantations would be about 1,000 feet above sea level and the ground generally consists of easy slopes. The main road passes through for 6 miles with pineapples either side, not even being fenced off.

Plate 60.
Twelve-months-old pineapple plantation in Hawaii.

Soil.

The soil is all volcanic and is red in colour, and also sticky when wet. Analysis show that it contains up to 40 per cent. of iron, but owing to the presence of manganese the plant cannot get it, hence the use of a sulphate of iron spray. It is considered that it does not pay to work less than 40 acres in one plot. The canners all grow their own fruit, and use 70 h.p. Deisel tractors to plough and work the soil. These tractors cost 7,500.00 dollars. Deisel oil costs 7 cents per American gallon.

In the repreparation of a pineapple plot—that is when the crop cycle is considered spent—a high powered pulverizer is driven through the fields, and the old plants shredded up and worked back into the soil. This land is spelled for two years, and periodically the soil is turned up to the sun, which helps to kill soil pests. They do not now plant any other crops, as they consider that this will only encourage pests and diseases. Iron spikes 18 inches to 24 inches are used for subsoiling. Care is taken not to turn up the subsoil to the surface.

Planting.

First of all the ground is surveyed and the intended rows are marked off with poles or pegs. Attention is given to the fall of the ground in case of heavy rains which would bring about wash-outs also to provide suitable drainage. A border line say approximately 20 feet wide is pegged all around the main plot. This would be used as a border planting. Then a road 10 feet wide is made between the border and the main plot. Pests, particularly mealy bug, would get in here first before they came to the main area. A rigid watch is kept on this border planting. In some cases a strip of 6 x 1 hardwood is placed outside of this again. A machine keeps this timber sprayed with creosote. In Hawaii all pineapples are grown with the aid of paper mulch. The ground all being pegged out, the mulch is run out by a machine. This mulch costs two and a quarter dollars per roll, the roll being 600 feet long and by 3 feet wide.

Two row planting is the favourite method and evidently gives the best results.

	Inches.
Width of paper	36
Between rows of paper	30
Between 2 rows of slips of paper	26
Between a row of slips	12
Plants to the acre	15,800

It has been found that by setting out this number of plants per acre, fruit of good but not over-large cannery size is obtained with maximum yields of fruit and minimum weed growth.

Slips or nibs are used, if obtainable, and are fumigated if necessary before planting. I understand that their plants throw slips both summer and winter. They favour planting in November-December, which is early winter, so that the first crop would come in the summer.

If a planting is successful they have a main plant crop (summer and winter) and two ratoons so that the cycle is 4 to 5 years. A fair average cycle is 45 tons of fruit per acre but the production goes as high as 100 tons per acre.

Fruit costs from 12.00 dollars to 25.00 dollars per ton at the Cannery.

Manuring.

Sulphate of ammonia is used as a fertilizer and sulphate of iron as a tonic to counteract the harmful effects of excessive manganese in the soil. I understand that with the exception of scrub soils in the Mary Valley, Queensland pineapple soils do not contain harmful quantities of manganese. Shortly after the slips have taken root a small quantity of sulphate of ammonia is placed in the base leaves. Care is taken in this application so as not to injure the centre of the plant. This application is probably the most important one, as it tends to give the plant a good start off. The plants are then sprayed with sulphate of iron, 25 lb. of this being diluted in 100 gallons of water. It has been proved that both iron and ammonia are necessary in Hawaii, and the one does not give the same results without the other. About two months before the plant crop (which takes 18 months with slips) 400 lb. per acre of sulphate of ammonia not diluted is placed in the base leaves and another 400 lb. two months after the crop. You will notice that I have not mentioned any fertilizers for the soil.

Fertilizing through the axils of the basal leaves is necessary, because the soil around the plants is covered with paper mulch, which is impervious to water. Little potash or phosphoric acid is applied to pineapples in Hawaii, since their soils are mostly well supplied with both these plant foods.

Grading and Trimming.

Fruit is carried to the end of rows in bags slung over the shoulders. The tops are then cut off slightly into the fruit and the base trimmed, there then being no sign of any leaves whatsoever. Fruit would be three-quarters to fully coloured. Only good fruit is graded into the crates, badly fanned types being absolutely discarded. The grades are similar dimensions to ours, but the No. 4 or large size would be 70 per cent. of the total crop. The tops are left to dry at the end of rows or if they become too plentiful and a nuisance broken up by a shredder.

Crates.

Inside measurement—Length, 18¼ inches; width, 14¾ inches; depth, 12¼ inches. This crate holds 56 lb. of fruit. The different canneries own their own crates.

Plate 61.

Newly planted pineapple field in Hawaii, showing use of paper mulch and method of setting out rows.

Pests and Diseases.

Mealy Bug and Nematode.—The chief cause of wilt in Hawaii is attributed to the mealy bug, and the industry was badly hit until a spray was found to effectively combat it. It seems that this bug is carried from one plant to another by an ant which fosters it and feeds off it. Where you find mealy bugs you will also find the ants.

Spray.

All oil spray to combat mealy bug wilt was patented by the Standard Oil Company, and was sold at 30 cents per gallon. A spraying machine with high powered mixer was also invented. These machines spray up to 450 acres per day, doing 32 rows at a time, 8 men each side. It takes a big pressure to displace the mealy bug from the eggs, and she generally gets at the base of the leaves and stems. In fact, the ants will pack soil or dry grass around them to keep them away from the sun which will destroy them if exposed too long. The machine gives a pressure of 300 lb. and up to 150 lb. at the nozzle.

Nematodes.

Under a magnifying glass these pests resemble tiny eels. Two types of fungi have just been discovered which are parasitic on nematodes. I do not think that either of these fungi have been cited as a positive cure for this pest as yet.

Plant Selection.

This also plays a big part in fruit production. As I mentioned before, practically all slips are used as planting material, and when the crop is on workmen are detailed to mark off the different plants which give the best type of fruit. They each carry a knife, and simply split a leaf and attach a piece of paper to same. They may even cut a pineapple to examine it for texture and colour. If the plant shows any sign of mealy bug a different coloured paper would be attached, and the material would be treated before being used for planting.

It is claimed that yields have been increased five to six tons per acre solely through systematic plant selection. In this, as well as in every other direction, the pineapple industry in Hawaii is endeavouring to reduce production costs by increasing yield per acre.

Conclusions.

My observations show that our Queensland pineapple-growers would be wise to give serious consideration to the following:—

1. Plant Selection.—This can be done by planting or otherwise marking plants bearing unsuitable and poor-quality fruit, and taking care that no planting material is taken from these plants.

2. Fumigation or dipping of all planting material to ensure the destruction and prevent the spread of mealy bugs at the start.

3. Follow more closely the Hawaiian method of close planting. This will eliminate a lot of unnecessary labour in keeping non-producing ground free from weeds.

4. Follow the Hawaiian practice of using quick-acting chemical fertilizers and, where manganese chlorosis occurs, spray with sulphate of iron and sulphate of ammonia.

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CARE OF THE SEPARATOR.

The operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, bucket, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to re-infect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

Fat Lamb Raising

DRENCHING FOR WORMS IN SHEEP.

The Secretary for Agriculture and Stock (Hon. Frank W. Bulcock), has made available the subjoined memorandum on drenching for worms in sheep by Mr. F. H. S. Roberts, Entomologist, Animal Health Station, Yeerongpilly:—

IN recent years carbon tetrachloride has been used extensively throughout Queensland as a drench for stomach worms in sheep. The drug has proved very effective for this purpose, but in several instances, its use has been followed by moderate to heavy mortalities. Within the past two years examples of this toxicity have been very conspicuous, due most probably to the more extensive use of the drug. In other parts of Australia, similar mortalities among sheep drenched with carbon tetrachloride have also been experienced, notably in New South Wales.

The actual cause of these mortalities remains, in the majority of cases, undefined. In so far as sheep are concerned, a calcium deficiency is known to be predisposing condition to susceptibility and by feeding a lick containing the necessary element for some time before drenching the drug may be given without any subsequent ill-effects. Other conditions which may be concerned with toxicity are said to be cold, bleak weather, a sudden drop in temperature after drenching, the feeding of concentrates, and hard feed. There are many cases, however, which remain unexplained. Impure samples of the drug itself may be conducive to losses, but it is pointed out that, on several occasions in Queensland where losses have followed the use of carbon tetrachloride, a sample of the drug used has been proven to be pure and moreover, its use on sheep at this station, has not been followed by any untoward results.

At the present time, there are no precautions which may be taken so that carbon tetrachloride may be used with safety. Cases are known where this drug has been used over a long period without any subsequent noticeable toxicity, and then, for some unknown reason, heavy losses occur. These losses have become so serious that it is felt that the drug can no longer be recommended.

For the sheepman, who, despite this warning, still desires to use carbon tetrachloride, it is most desirable that a small number of animals be treated a few days before the mob and carefully watched for any ill results. Even this precaution may not safeguard against losses, as one case is known in which two mobs of sheep on the same holding were drenched with the same sample of carbon tetrachloride a few days apart. No symptoms of toxicity occurred in the first mob, but heavy losses were experienced in the second mob.

Carbon tetrachloride owes its widespread use to its great degree of effectiveness and ease of administration. The dose is small, five cubic centimetres, and no previous starvation is required. Bluestone is not quite so effective as carbon tetrachloride, and it was at one time considered that previous starvation was necessary to its efficiency. Recent work by the C.S.I.R., however, has shown that such starvation is not required, and that moreover if Blackleaf 40 is added to the bluestone, the mixture is highly effective against both stomach worms and hair worms. From results secured with a somewhat similar combination in other parts of the world, the mixture recommended in Australia should be effective against tapeworms also.

In this bluestone and blackleaf 40 drench we, therefore, have a vermifuge which is effective against three different sorts of worms, is cheap and very safe. Carbon tetrachloride is effective against stomach worms only and cannot be regarded by any means as being safe. It is also dearer than the bluestone mixture, and the only feature in its favour is the comparative ease of administration.

The formula and dosages of this bluestone in blackleaf 40 drench is as follows:—

Bluestone	1 lb.
Blackleaf 40	16 fluid oz.
Water	5 gallons

Dosages.

18 months and over	2 fluid oz.
12 months-18 months	1½ fluid oz.
4 months-12 months	1 fluid oz.
Under 4 months	½ fluid oz.

In country where liver fluke is present, carbon tetrachloride is by far the best drug that can be used against this parasite, but fortunately, liver fluke is not present throughout any of the sheep districts in Queensland. There is, therefore, no reason why carbon tetrachloride should continue to be used as an anthelmintic for sheep in this State, whilst we have at our disposal this bluestone-blackleaf 40 mixture, which is cheaper, decidedly safer, and more effective as an all-round vermifuge.

BRITISH DEMAND FOR PORK.

Reports received by the Commonwealth Department of Commerce indicate that there will be a fairly strong demand in Great Britain this season for Australian frozen pork. About 900 carcasses were shipped from Melbourne on 22nd November. The chief veterinary officer of the department in Victoria (Mr. Ross Grant) said on 21st November that there had been a general improvement in the quality of pork for export in the last three years. There was now a steady market in Great Britain for frozen bacon pork weighing from 100 lb.

The Dairy Produce Acts.

By G. B. GALLWEY, Inspector of Accounts.*

THE present Dairy Produce Act was passed as far back as 1920. Although it was then considered to be one of the most advanced and comprehensive works at that time, changed conditions and the march of science have made it necessary to have this Act reviewed.

In order to find out what was in the mind of the industry itself in the various matters which are subject to regulation, conferences of both the butter and cheese sections were held recently when the many aspects of the industry were discussed and resolutions suggesting alterations and additions to the original Act were passed.

The Department has now given further consideration to the whole matter of an improved Act. This has resulted in the passing of some important amendments to the Act, and these became law on the 5th of December.

The regulations are now being reorganised with a view to including those matters suggested by the industry and also to improve the existing ones. The object generally is one of quality uplift which means that in the interest of the farmer and the State some tightening up of the old regulations is both desirable and necessary.

Under the old Act some of the buildings on a dairy farm were not defined or else were defined as a building and a yard. Consequently there was always some doubt concerning these. However, by amendments the following are now clearly set out and defined in the Act:—

Bail, Milking Shed, Milking Yard.

The system of registering dairies has been changed. Under the old Act a dairy could not be registered unless the premises complied with the Act, and once a registration was granted it remained in force for all time.

The fact that many could not wholly comply and were not registered hampered administration and seriously affected the operations of other regulations.

The amending Act gives power for every dairy to be registered upon application, irrespective of its condition, and the registration then remains in force until cancelled, which power is vested in the Minister. The provision that any dairy may be closed by an Inspector is being strengthened.

These alterations do not mean that there will be less control over dairies than formerly. Actually the more direct action in the case of unsatisfactory produce being produced should hasten improvements, for the power to cancel a registration exists, and if that power is used it means that the dairy can be closed and the product prohibited from being sold for any purpose.

Further, should a dairy farmer persist in an attitude that work, which is considered for the good of the industry, should not be done, the Act has very definite powers that can be used.

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* In a radio broadcast from Station 4QG, through the courtesy of the Australian Broadcasting Commission.

Any person who sells milk for local consumption must first have a license from the Health Department, and though his premises may be registered under the Dairy Produce Act it will be necessary for a certificate to be issued by an Inspector that the premises comply with the requirements of the Dairy Produce Act.

Provision has been made under this section of the Act for advice to be furnished of any transfer of a dairy.

A new section has been inserted to give more complete control over swine on dairy produce premises.

The audit powers of the Act have been strengthened by prescribing the books and accounts to be kept at a factory.

Section 16 of the Dairy Produce Act has been amended by the inclusion of three new clauses, the first fixes the method of payment for milk at a factory, the second prohibits the diversion of milk or cream from a factory without giving twenty-eight days' notice, and the third provides for returns to be furnished each month to the Under Secretary by a factory showing its manufacture, payment, and disposal of any dairy produce as defined by the Act.

The second amendment, the diversion of supply, is the most important from the farmers point of view. The clause is divided into three parts and deals first of all with cream. It says that no dairy farmer can transfer the whole or any portion of his cream from one factory to another until twenty-eight days after he gives notice to the factory.

It does not stop a farmer from leaving a factory, but it does stop him from making a transfer without first giving notice.

However, it must be obvious that in the interest of quality and economy the dairyman should send his supply to the nearest factory. This clause will give him time to consider and will also provide an opportunity for the Department to investigate the position as there are many instances where a change is now made on the slightest pretext. I might mention that the dairy farmer can always have his interests protected by applying to the Department.

The same conditions apply to a milk supplier to a cheese factory who wishes to transfer the milk to another cheese factory, but if he wishes to cease supply milk and supply cream to a butter factory, he must also have his dairy premises in compliance with the requirements of the Dairy Produce Act. A supplier shall not, however, be guilty of an offence if he can prove that this supply was diverted on account of circumstances over which he had no control.

Factories will also be required to furnish the Department with a return showing the names and addresses of suppliers who have commenced or ceased to suply during the month.

The Department will thus have a record of all transfers of supply, and where it is found the owner has failed to give the necessary notice definite action will be taken against such persons.

A very definite step in the control of transport of cream by road has been made by Section 16B of the amending Act.

The Act did not previously deal with transport arrangements, and as a result much overlapping in road transport is occurring in many localities. The new section provides for the proclaiming of certain roads as cream routes. Factories will be empowered to call for and accept tenders for these routes. Subject to the carrier's equipment complying with the Act the Minister may issue a license if he approves of the terms and conditions. The intention is that the carrier will have to give an adequate service and in turn he will be protected from competition.

Under existing conditions a carrier may work up a good run and be giving service, yet he had no protection from competition. Any person with any sort of equipment could start in opposition and cut the rates of cartage, during peak periods, and spoil the work of the man who had established a satisfactory service. There is definite evidence that road transport has been used to increase inter-factory competition. Therefore this section has been designed to eliminate such evils and give a better service all the year round.

No person can run on a proclaimed cream route without a license and no factory can accept cream from a carrier who has no license. This does not prohibit a farmer from carting his own cream, but he cannot carry his neighbours' cream along a proclaimed route.

This may appear to be arbitrary, but if a carrier is prepared to provide a regular service it can only be successful if such a service is supported by all the dairymen. Of course there will be many places where it will not be possible to have proclaimed routes, and these will not be disturbed except that the conditions under which cream is to be carried will be tightened.

It may be pointed out that before this section can be put into operation regulations are necessary. These are in the course of preparation, and cover the following:—

Specifications of vehicle for cartage of dairy produce and the conditions to be fulfilled by a carter, who is licensed to carry dairy produce.

The Minister may appoint a Committee to investigate and report to him on any question or dispute of any nature on transport.

He may adopt the whole or part of the recommendation of the Committee and take any action he thinks fit regarding routes and the issue of licenses.

By an amendment of Section 17 the grades into which cream shall be classified have definitely been fixed and the grades of milk stated.

The power of a factory manager has been strengthened by Section 19 dealing with cream unfit for the food of man. Formerly he could only reject cream which was putrefactive, now he can reject any cream which he considers unfit for human food. He cannot destroy the cream but can colour it with cochineal or lamp black and return it to the supplier.

Section 20 has new clauses included, one fixes the standard for processed cheese, and another prescribes that milk shall be delivered by a fixed hour at a cheese factory.

This hour will be fixed by regulation. The section also prohibits the owner of a factory from buying or receiving milk or cream which does not comply with the standards prescribed.

Section 23 requires that butter or cheese makers must have the qualifications and pass the examination prescribed and hold a certificate. It also provides for the recognition of certificates obtained in other States of the Commonwealth or New Zealand.

By amending Section 31 the penalty for offences has been made uniform and shall not exceed £30.

To give power to make regulations under the sections that have been amended, the schedule has been amended accordingly.

The regulations have been carefully prepared and the field officers of the Dairy Branch have discussed them and are of the opinion that the regulations will do much towards the uplift of quality and incidentally assist the industry generally.

It is regretted that time and the fact that the Regulations have not been gazetted does not allow of a more detailed explanation.

However, let me conclude by assuring those interested in the industry that the earliest opportunity will be taken of outlining the principal changes and alterations.

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RURAL RELIEF.

WITH the passage, through the State Parliament, of "*The Farmers' Assistance (Debts Adjustment) Act of* 1935," legislative authority has been provided for the distribution of Queensland's share of the Commonwealth fund provided for rural rehabilitation. The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) has announced that necessitous farmers may now make application for assistance under the scheme. The moneys can be used only for the adjustment of debts, and an advance may only be made to a farmer who successfully arranges a composition of his debts or enters into some other suitable scheme of arrangement involving compounding with his creditors. This is a provision of the Federal Act, and the State's legislation is complementary to that of the Commonwealth. Applications for purposes other than compounding of debt cannot therefore be considered by the Rural Assistance Board. Debts and liabilities due to the Commonwealth or a State cannot be brought under the scheme, but rates to a local authority may be included in a composition or scheme of arrangement.

The scheme in Queensland will be administered by the Rural Assistance Board, using the machinery of the Agricultural Bank, and application must be made on the prescribed form. Any farmer desiring information concerning the scheme, or an application form, may obtain it on request direct to the Board. All inquiries must be addressed to the Registrar, Farmers' Rehabilitation Scheme, care Rural Assistance Board, Box 38A, G.P.O., Brisbane.

The Minister further explained that any person engaged in farming operations is eligible to apply for assistance. For the purposes of the Act "farming operations" include farming, agricultural, horticultural, pastoral or grazing operations, dairy farming, poultry farming, bee farming, and viticultural operations.

Bureau of Sugar Experiment Stations.

Review of Annual Report.*

Sugar Statistics.

Crop of 1934.

A review of the sugar yields for the 1934 season shows that some 612,570 tons of 94 n.t. sugar were produced in Queensland. The cane crop amounted to 4,270,000 tons, harvested from 218,426 acres. This gave an average yield of 19·56 tons of cane and 2·80 tons of sugar per acre, and 6·97 tons of cane were required to make a ton of sugar.

A study of the yields for the past thirty-five years shows the remarkable improvement in mill and farm efficiency which has been effected during the periods. The average values for 5-year periods are shown by the accompanying graph (Fig. 1).

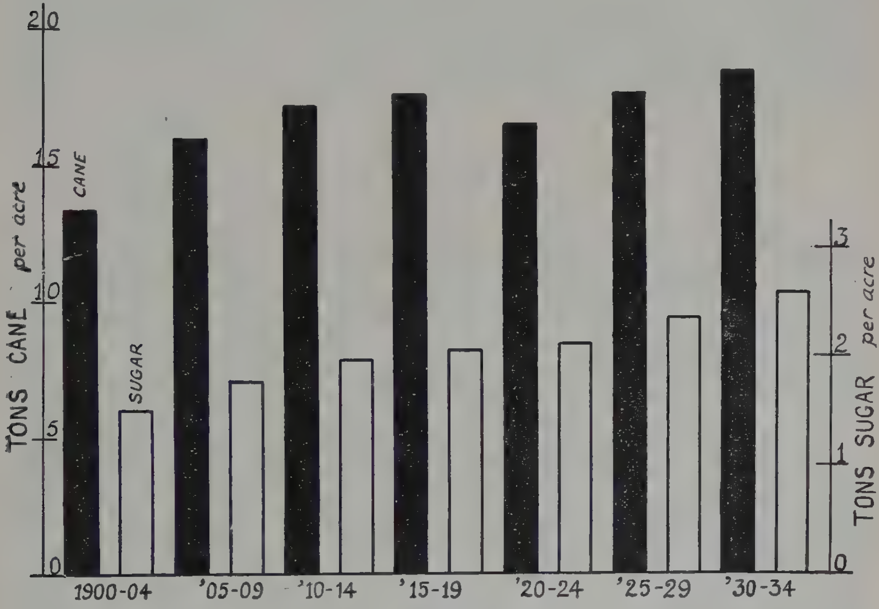

Plate 62.

Fig. 1.—Illustrating the Improved Acreage Yields of Cane and Sugar for the Period 1900-1934.

While cane yields have fluctuated somewhat, they show a distinct upward trend. The improvement in sugar yields is, however, most striking. From an average of 1·5 tons per acre for the period 1900-04, the figure has increased consistently until for the final period (1930-34) it attained the value of 2·60 tons; while for the years 1933 and 1934, the yield was 2·80 tons per acre. An analysis of the causes contributing to this improvement shows that it is due in almost equal proportions to improved field practices and increased mill efficiency.

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* Reprinted from the current "Cane Growers' Quarterly," published by the Bureau of Sugar Experiment Stations.

Economic Review.

The end of the steady increase in acreage yields—which appear to be largely independent of the season—is not yet in sight. Each year more farms are brought under irrigation, and farmers are applying their knowledge of fertilizers and their use to greater advantage than ever before; while the full possibilities of the newer, disease-resistant, high-yielding varieties have still to be realised.

All these factors contribute their quota to a permanent downward trend in production costs; but, unfortunately, they are largely defeating their purpose through the failure of the grower to reduce the area planted to the crop, in proportion to the increased acreage returns; and this simple and obvious remedy for the present ills of surplus production becomes annually more difficult of accomplishment. Reduced costs are possible only where the production per grower exceeds a definite minimum tonnage, the magnitude of which must increase as the value of sugar falls. Moreover, the farmer finds it necessary to provide for his growing family; and whereas formerly, his sons were able to acquire blocks of new land on which to cultivate cane, the present assignment restrictions now necessitate further subdivision of the existing farm. That the number of canegrowers in Queensland is steadily increasing is evident from the following statistics:—

Year.	No. of Canegrowers.
1932	7,231
1933	7,386
1934	7,426

The average sugar tonnage which each grower may contribute to the mill "peak" is, therefore, diminishing in proportion.. This is a serious matter in certain mill areas where the average quota per grower is less than 300 tons of cane, which is definitely below the economic minimum on which a farm may be conducted efficiently, and a system of permanent agriculture maintained.

The possibility of any early improvement in world sugar values is still remote, and each year the available free market for the export production of countries such as Australia is contracting. In August last, the signatories to the Chadbourne Agreement agreed not to attempt to prolong the plan which expired this year. The plan failed to achieve its full purpose, due to the action of those countries outside the Agreement, which increased their production in proportion to the restricted output. Certainly visible stocks have been very substantially reduced during the currency of the Agreement. It is realised, however, that something further must be done to stabilise the industry. The United States of America recently took measures to restrict domestic and insular production to actual requirements, while a trade treaty was entered into with Cuba, which country gained an increased sugar preference in the American market. In London, the International Sugar Council called a conference in March last, which was attended by representatives of the important sugar-producing countries of Europe, and also of the United States. Although this Conference failed to formulate a generally acceptable and constructive plan, appreciation of the need for concerted action is evidenced by the desire for a further Conference at an early date. As a preliminary the British Government has arranged for a full discussion of the relationships between the Home country and her sugar-exporting Dominions, with a view to formulating a policy for the British Empire. The Conference will be held early in 1936, and Australia will be represented by a nominee of the Federal Government, while the Premier of Queensland (The Hon. W. Forgan Smith) will personally attend on behalf of the Queensland sugar interests. The present preference granted to Dominion sugar by the Government of the United Kingdom will continue until August, 1937—that is, for a further Queensland crop year. Any unfavourable modification of the present policy would be accompanied by serious results for at least a section of the Queensland sugar-growers; though it is not profitable to produce sugar at present overseas values, the loss of the British market and preference would necessitate the immediate reduction of production to the bare domestic requirements of this country; the consequences of such precipitate action need no recapitulation.

The announcement by the Federal Prime Minister that the Australian Sugar Agreement will be renewed for a further period of five years brings to the industry a measure of reassurance, and demonstrates in no uncertain manner that the Federal Parliament is appreciative of the national importance of the sugar producer. It now rests with the industry to take such measures as will effect a sustained policy of rationalisation, and thus establish the business of sugar production on a firmer economic basis.

Bureau Affairs.

Advisory Board.

The Advisory Board met on four occasions during the year, when matters of major importance were dealt with. The decisions of the Board are definitely playing a very important part in shaping the policy and guiding the activities of the Bureau.

The Board has paid very close attention to staff matters, and steps have been taken to make such appointments as will provide a balanced staff of competent officers in all fields of sugar technology. The weaknesses on the mill technology staff have been overcome to a large extent by the decision to appoint a Consulting Mill Engineer and a further Assistant Mill Technologist. The question of the efficiency of pest control was also dealt with, and the Board decided that a meeting of representatives of North Queensland Pest Boards should be called in Townsville, under the Chairmanship of Mr. A. F. Bell, to formulate plans for future co-ordinated effort. It was also agreed that Mr. W. A. McDougall, Assistant Entomologist, be delegated the duties of an intensive study of the life history and habits of the rat, for the purpose of devising more adequate measures of control.

A question which has also received careful consideration is that of the utilization of by-products in the industry, and extensive enquiries are being pursued for the purpose of obtaining information on the more adequate utilization of these materials.

Transfer of Experiment Stations.

During the year the building programme at Meringa was finalised. This Station is now equipped with adequate laboratory space for chemist and entomologist, a glasshouse has been provided for seedling work, and an irrigation plant for watering seedling canes and irrigation experimentation. It has been possible also to electrify all power units from the Cairns Hydro-Electricity supply. The Station was officially opened on Friday, 13th September, 1935, by the Minister for Agriculture and Stock (The Hon. F. W. Bulcock), in the presence of the Advisory Board, on the occasion of the visit of the delegates to the International Society of Sugar Cane Technologists' Fifth Congress.

Good progress has also been made with respect to the transfer of the Mackay Station to its new site on portion of the Palms Estate, Te Kowai. The buildings are practically completed, and early in the new year the Station will be in full working order. The old Station was disposed of as a special lease, and the improvements, which were the property of the Bureau, were taken over by the lessee for a cash consideration. The new Station presents many problems which are common to a large area of the Mackay canelands, and it is felt that much useful work will be done at this centre.

The Bundaberg laboratory has been equipped to enable the resident Soil Chemist to carry out routine and investigational chemical work; this officer is also making a special study of irrigation matters, with particular reference to the duty of water. New stables and implement buildings will be constructed during the current financial year, utilizing as far as practicable materials from the existing collection of outhouses and farm buildings.

Irrigation Experimentation.

The first irrigation trial on a field scale, to be carried out by the Bureau, was harvested on the Bundaberg Station during the current season. This is merely the forerunner of a series of controlled experiments which should provide us with much valuable information concerning this phase of sugar-cane agriculture. Our water reserves are, unfortunately, not as extensive as one would desire, but they serve for a modest experimental block or two, in addition to taking care of the young original and selected seedling canes at that centre.

At the present time arrangements are being made for the installation of a rather larger pumping plant at Mackay, while the 3-inch pump at Meringa is operating successfully.

During the year the installation of a spray irrigation system was completed in the Burdekin district. Improved sprinklers, each capable of irrigating one-third acre, were employed, and reports to hand suggest that it gives a satisfactory spread. The trial block is intended as a means of studying the influence of variations in the rate of water application and fertilizer treatments, rather than as a spray system *per se*. It is electrically operated, and is under the direct supervision of the Field Assistant, Mr. A. P. Gibson.

Seedling Propagation.

The continuity of the work at the Northern and Central Stations has been disturbed somewhat by the change in the location of the respective Stations. More serious was the unduly low proportion of arrowing experienced at Freshwater during the past season; many of the canes failed to arrow, while others gave little seed.

A number of promising canes have now been selected for field trial on all three Stations, from canes bred during the past few years. In the North, a number of Q series seedlings have been placed in yield trials on selected farms, while three of the most promising seedlings raised at Mackay are now in a plot trial at that Station. In Bundaberg, the final selections of the coming year will be similarly dealt with.

Some 25,000 new seedlings were planted in the field during the spring of 1935.

Work of the Experiment Stations.

Meringa Station.

As only sufficient land was available at Meringa for seedling propagation and the production of stocks of disease-free Badila for future plantings, no experimental plots could be planted. This will be effected, however, as the forest is cleared and the land is brought under the plough.

Mackay Station.

With the vacating of the old Station, it was necessary to speed up the harvest of the standing crop, and only one experimental block was harvested plot by plot. This was the trash conservation trial. The results did not reveal any increased yield benefits due to the treatment, but the piece of land on which the trial was conducted showed very pronounced variations. One point of interest, however, was the very decidedly improved c.c.s. value for canes from the trash-treated plots; this was 1·2 units higher than for the untreated cane, and while it appears to be significant we are at a loss to determine the true explanation.

On the Te Kowai site, a seedling trial and a qualitative fertilizer experiment were set out, and further trial blocks will be planted in the coming year. It will be possible to carry out our experimental work much more effectively than at the old Station, due to the absence of gross soil variations which marred many of our previous trials.

Bundaberg Station.

A series of interesting trials were harvested from the Bundaberg Station during the 1935 season. These embraced certain of the new disease-resistant canes, and the improved yields over the old standard (Q. 813) is reflected in average tonnage per acre for the entire Station, which this year rose to 22·65; having regard for the unfavourable season experienced, this is decidedly satisfactory. The following comments are offered on the individual trials:—

Irrigation Trials.

It will be recalled that an area of the Station was devoted to a small-scale irrigation trial, to demonstrate the value of liberal watering and manurial treatment on the red volcanic loam of the Bundaberg area. The results of the plant crop were reported last year, and the first ratoon yields are now available. The following is a summary of the two crops:—

——	Plant Cane.	First Ratoon.
Cane, tons, per acre	93·4	72·8
C.C.S. in Cane, per cent.	12·1	13·0
C.C.S., tons per acre	11·3	9·5

These results demonstrate beyond doubt the value of irrigation on this soil type, with a cane variety such as P.O.J. 2878. Over the two crops 166 tons of cane per acre were harvested, which yielded almost 21 tons of c.c.s. per acre. The trial will be continued to the second ratoons.

The first field-scale irrigation trial to be harvested on the Station was conducted during the past season. The variety was P.O.J. 2878, and the trial was set out to determine the relative value of *cane furrow* v. *interspace* watering. Though the former produced a somewhat heavier crop, the yield increase (2·2 tons of cane) did not compensate for the extra water required. The average crop was 44 tons of cane per acre, and no water was available until February.

Trash Conservation Trials.

Two trials of this nature were harvested during 1935. The first was designed to show the relative value of *volunteering* v. *relieving* v. *rolling* v. *burning;* as was the case in 1934, no treatment showed any definite superiority.

The second trial was harvested from the permanent trash plots which were established two years ago. The variety was Q. 813—a first ratoon crop following a heavy plant cane harvest. The excessive body of trash which had been rolled into alternate interspaces was definitely responsible for a poor ratoon on the trash plots, and a crop loss was actually recorded due to the treatment. This should not be interpreted as evidence against the practice, but rather as demonstrating the necessity for a vigorous ratooning variety where trash conservation is desired.

Varietal Trials.

Two varietal trials embracing the new, gum-resistant canes which are now becoming popular in the southern areas were harvested. One of these was a second ratoon crop, in which the outstanding superiority of Co. 290 and P.O.J. 2725 over the standard Q. 813 was clearly demonstrated. The following is a survey of the yields for three crops of these varieties:—

Variety.	Plant Cane.	First Ratoon.		Second Ratoon.	
	Cane per Acre.	Cane per Acre.	C.C.S.	Cane per Acre.	C.C.S.
	Tons.	Tons.	Per cent.	Tons.	Per cent.
Co. 290	22·8	49·4	15·1	36·2	14·5
P.O.J. 2725	16·8	48·1	17·2	24·0	16·2
Q. 813	9·3	17·8	14·1	11·5	13·0

It is not necessary to emphasise the value of these drought-resistant canes which produce consistently satisfactory crops on the dry red volcanic loam. While they yielded heavy ratoon crops in both years, the Q. 813 ratoons were virtually a failure.

The second trial (first ratoon) included a further series of new varieties; the yield differences between the standard (Q. 813) and the best of the selection were more pronounced than was the case with the plant crop. U.D. 1 and 39 were definitely superior to Q. 813, but it is doubtful whether either is superior to P.O.J. 2725 or Co. 290.

Time of Application of Sulphate of Ammonia.

It is the policy of the Bureau to advocate the early application of manures, and it is considered that sulphate of ammonia top dressings should be applied when the plant cane is stooling vigorously. The influence of time of application of ammonia was tested with a crop of P.O.J. 2878. The following were the yields for the respective treatments:—

Time of Application of Sulphate of Ammonia.	Cane Yield.
	Tons.
1. In planting furrow	21·2
2. Half in furrow, half in October	21·0
3. One-third in furrow, one-third in October, one-third in December	20·3
4. One-third in November, one-third in January, one-third in March	19·3

Though the reduction in yield due to the later applications is not highly pronounced, it is anticipated that the ratoons will supply more definite figures.

Cultural Trial.

A combination trial with P.O.J. 2878 was set out, to determine the value of subsoiling, cultivation, and interspace distance with the new variety. Any benefits from subsoiling were not apparent, which is in agreement with our previous findings on this soil type. Again, cultivation was of little benefit, provided excessive weed growth was controlled. Slight influence in yield was effected by reducing the interspace distance from 4 ft. 6 in. to 4 ft.

An interesting side issue of this experiment was the fact that due to a poor strike portion of the block was replanted in the spring, whereas the balance had been planted in the previous March. The yields for the autumn and spring planted cane were—

—	Cane per Acre.	C.C.S.
	Tons.	Per cent.
Autumn plant	27·9	15·2
Spring plant	19·0	14·1

The influence of time of planting on both yield and c.c.s. is strikingly demonstrated.

Division of Entomology and Pathology.

The investigational work of the Division was a good deal hampered by climatic conditions, but "it is an ill wind which blows nobody any good" since that also means that diseases and pests have been less of a problem than usual.

The new quarantine glasshouse is being put to good use. Two varieties have been imported from the United States, one from India, and two seedlings from the nurseries of the C.S.R. Company; the variety from India is a cross between Co. 290 and P.O.J. 2878, and its future will be watched with interest. We have also imported a reed somewhat closely related to sugar-cane to be used in breeding experiments and, in addition, four sugar-cane-sorghum hybrids from India. These hybrids are lacking in vigour but have good sugar content and mature in about six months. We are hopeful that when moved to North Queensland they will not prove to be "mules" but will yield pollen which will enable them to be crossed back to cane. If this can be done then our chances of building up an early maturing cane would be very promising.

Gumming disease in the South showed a further decrease with the reduction in the amount of old susceptible varieties grown. Fortunately, it is comparatively easy to breed canes which are resistant to this disease, but it frequently happens that some of the most resistant are also highly susceptible to Fiji disease. A Fiji disease resistance trial concluded during the year, served further to confirm the high susceptibility of Uba and P.O.J. 2725, 2875, 2878, and 2940. P.O.J. 213 and P.O.J. 234 exhibited high resistance, while Co. 290 made a pleasing showing in the preliminary trial.

In a downy mildew trial carried out in the Lower Burdekin area the variety S.J. 7 showed some susceptibility, and it is apparent that the numerous fields of badly-diseased B. 208 will prove a menace to this cane if they are allowed to stand. P.O.J. 2878 again showed that it is more susceptible even than B. 208.

Chlorotic streak disease was again very evident in the districts north of Townsville and is unquestionably responsible for considerable damage in the lower, wetter areas. A series of plantings of clean plants, made in several districts, shows that spread is rapid in the low, wet areas, but at least very slow on the elevated red volcanic lands. We are now testing the rate of spread in these low areas when the whole field is planted with clean plants.

It may be recalled that last year we carried out a trial at Tully to determine the field losses due to planting diseased plants and found that the yield decreased from 30·4 tons per acre in the healthy plots to 20·7 tons per acre in the diseased plots. This cane was ratooned, and although the disease then soon appeared in practically all stools of the previously healthy plots, nevertheless it was apparent that the stand was much better than that in the plots planted with diseased cane. On harvesting at the beginning of December it was found that the yield from the originally healthy plots was 28·2 tons per acre as compared with 21·2 tons from the diseased. Thus the benefit of the healthy plants has persisted through to the ratoon crop.

The greyback beetle population was decimated by the unprecedentedly hot weather and little experimental work could be carried out. It had been intended to undertake extensive trapping experiments, but these had to be abandoned. An early emergence took place in the Highleigh area, and over one hundred thousand were trapped on one farm. However, since no adjacent areas had any grub damage owing to the heat, it was impossible to tell whether any benefit had resulted. Experiments which were carried out with white arsenic again gave little benefit, but other methods of applying this cheap insecticide will be investigated.

A further attack on the greyback was launched in June when a colony of one hundred giant American toads was introduced into Queensland. Our Entomologist, Mr. Mungomery, had made a close study of the habits of these toads in Hawaii, and as a result we were able to construct a type of pond in which they bred freely although they had not previously been bred in captivity. Stocks have been liberated in the far northern district and appear to be thriving well. Unfortunately, the Commonwealth Government has prohibited their further distribution, at least for the time being, and we are unable to try the toads out in other districts. It is hoped, however, that further investigation will convince the Health authorities of the desirability of more extensive release of these animals.

The problem of rat control is now receiving specialised attention. Mr. W. A. McDougall, of the Mackay Station, has just spent some six weeks in the Ingham area, observing the problem at first hand, and during the current month will proceed to Sydney and Canberra for further study. He will then return and take up headquarters in the field.

PLATE 63.
A picturesque bend in the Russell River.

PADDOCK SYSTEM OF PIG-KEEPING.

THE modern method of keeping pigs, often referred to as the paddock or open air system, has much to commend it and is much to be preferred to intensive housing or the keeping of pigs in small covered-in sties. This does not, of course, infer that pigs need no housing or special feeding, for pigs are not profitable if kept under unnatural conditions. They need shelter and protection even where kept in paddocks, and they certainly need regular and efficient feeding and management at all times.

The flooring of pig sties is also an important part of sty feeding, the objective being a dry impervious floor that is not costly, and that can be kept clean with little expense. Sawn hardwood flooring tongued and grooved and strongly affixed is recommended for sties so constructed that a concrete or stone floor is unsuitable, especially where the sheds are for general purposes and not especially for continuous intensive housing. For the latter purpose, concrete or brick and cement floors are most essential in order to permit of constant use and of being kept clean every day.

These matters are referred to in detail in the pamphlet "The Pig Farm," available free of charge on application to the Department of Agriculture and Stock, Brisbane. In this pamphlet, Mr. L. A. Downey, H.D.A., Instructor in Pig Raising, deals at length with the question of housing and accommodation, and illustrates his pamphlet with plans and specifications and with drawings and photographs of sties and sheds such as are recommended for use on Queensland farms.

It is emphasised that ventilation should be provided in all pig houses and that the walls should be so constructed that cleansing is simplified. The flooring should be laid upon a gradual slope, the fall being outwards from within, to expedite surface drainage and facilitate removal of dung, urine, &c.

Where the sleeping portion of the floor is of concrete or brick and cement, that portion should also be covered with a permanent wooden platform, for which purpose used railway sleepers are ideal, if carefully dressed and placed in such a position that drainage off this platform on to the concrete and from thence to outside drain is convenient.

The drains should be in the form of an open concrete channel leading to a concrete cesspool which can be regularly cleaned out and disinfected. All manure, straw bedding, and other refuse from the piggery should be carted away and ploughed into the cultivation land and should not be placed in heaps open to infestation by flies, for if this is done a breeding ground for house flies, blow flies, &c., is established, and these pests will be a source of constant annoyance; the valuable manurial content of pig manure is also leached out by rain if placed in heaps exposed to the weather. In suburban piggeries where ploughing is not possible, a properly constructed concrete manure pit should be provided, and if this can be made fly-proof it is a considerable advantage. The manure should be carted away regularly.

Every effort should be made in providing accommodation for pigs, to provide the best that is possible with the money in hand, and for that purpose the buildings and yards should be constructed to a definite plan, and be completed before being brought into use.

Write for a copy of the pamphlet "The Pig Farm, Accommodation, and Equipment."

E. J. SHELTON, Senior Instructor in Pig Raising.

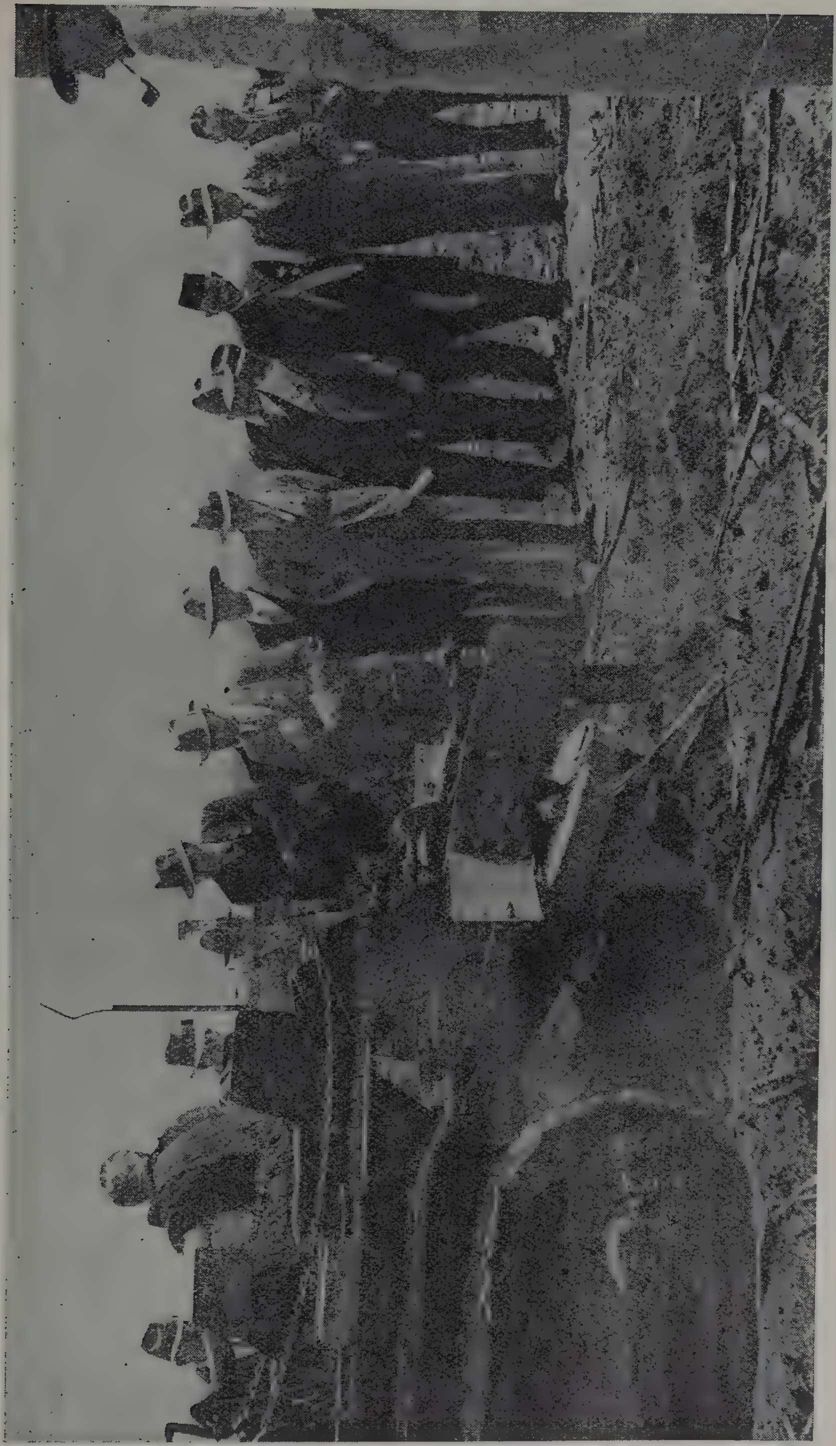

Plate 64.

Rotor tiller in action, Bingera Plantation.

[*Photo. by courtesy Telegraph Newspaper Co. Ltd.*

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of December, 1935 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Clonogan Constance	T. Strain, Wondai	10,068·92	452·718	Blackland's Courageous
Queenie 5th of Fairholme	Queensland Agricultural High School and College, Gatton	9,329·64	409·332	Regent of Greyleigh
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Brundah Elfin 2nd	K. Henry, Greenmount	9,043	338·19	Enchanter of Karowarra
Brundah Fanny 3rd	K. Henry, Greenmount	9,212·5	323·796	Greyleigh Osiris
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Navillus Shamrock	Con. O'Sullivan, Greenmount	9,033	325·683	Midget's Sheik of Westbrook
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Diamond Dale Gem	V. C. Ensley, Yandina	6,989·5	285·444	Diamond Boy of Burradale
Sunnyside Daisy 22nd	Paul Moore, Wooroolin West	6,846·19	257·981	Patrol of Cosey Camp
Rhodesview Fanny 23rd	W. Gierke and Sons, Helidon	6,340·16	253·204	Red Knight of Rhodesview
Montcairn Favour	A. E. Vohland, Aubigny	5,399·95	235·476	Dandy of Wilga Vale
	JERSEY.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Billabong Pansy	J. Mollenhauer, Moffattdale	7,365·44	413·747	Premier of Calton
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Overlook Remus Hazel	F. Maurer, Darra	8,895·96	453·851	Overlook Favourite Remus
Trecarne Myrtle 4th	D. R. Hutton, Cunningham	5,865·18	310·801	Trecarne Golden King

	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Lyndhurst Mary	J. B. Keys, Gowrie Little Plains	7,385·5	437·877	Lyndhurst Glider
Oxford Buttercup 8th	E. Burton and Sons, Wanora	5,694·77	372·511	Oxford Robin
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Camelon Bluebell	H. Neil, Brassall	6,017·9	357	Carnation Prince's King
Wyreene Creole	Mrs. M. Allom, Toowoomba	6,844·35	340·65	Lyndhurst Majesty
Bellgarth Pearl	D. R. Hutton, Cunningham	5,606·26	292·115	Trecarne Renown II.
Bellgarth Napoleonette	D. R. Hutton, Cunningham	5,242·09	278·262	Bellefaire Blonde's Bellringer
Windermere Floret	M. J. Dunn, Laidley	4,315·46	243·96	Glenmah Victor's General

A NEW TRASH-CUTTING DEVICE.

A novel plough attachment for cutting trash into short lengths preparatory to ploughing under is illustrated in Fig. 12. It is the invention of a Bundaberg canegrower, and should be received favourably by those farmers desirous of accomplishing this operation with ease and complete success.

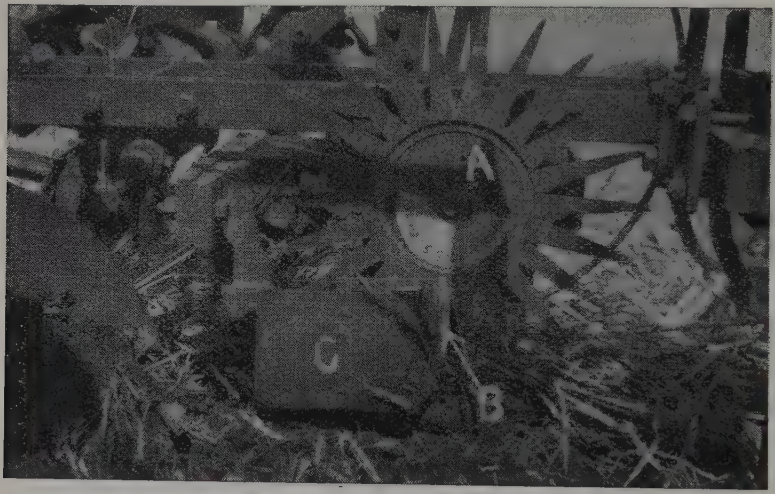

PLATE 65.
Showing the Essential Features of the Trash Cutter.

The cutting of the trash is effected by a star-wheel (A) and fixed knife (B) which are attached to the plough frame just ahead of the disc. As the implement moves forward the star-wheel revolves, and the points effectively pin the trash to the soil surface, when the sharp knife shears the trash and tops into lengths equal to that of the

PLATE 66.
Illustrating the Effective Work Performed by the Attachment.

plough-cut width. The short lengths of trash are guided into the preceding furrow by the small mouldboard (C), to be effectively covered by the next plough slice.

The attachment was demonstrated to the overseas sugar-cane technologists on the occasion of their visit to Bundaberg. The excellence of the work which was being performed is demonstrated by the accompanying illustration (Fig. 13). It will be observed that scarcely a blade of trash is evident on the ploughed section of the block. The soil type was red volcanic loam.

—H.W.K., in the "Cane Growers' Quarterly Bulletin," Bureau of Sugar Experiment Stations.

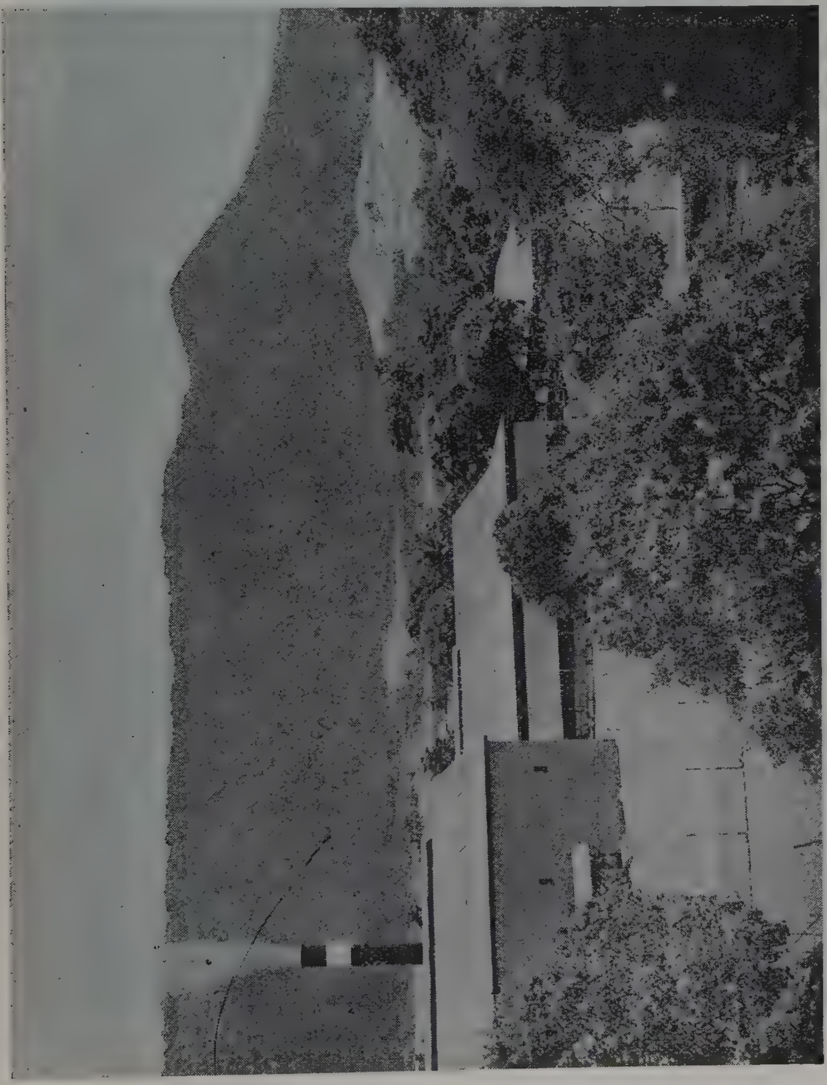

PLATE 67.
Hambledon Sugar Mill, near Cairns.
[*Photo. by courtesy of "The Telegraph," Brisbane.*

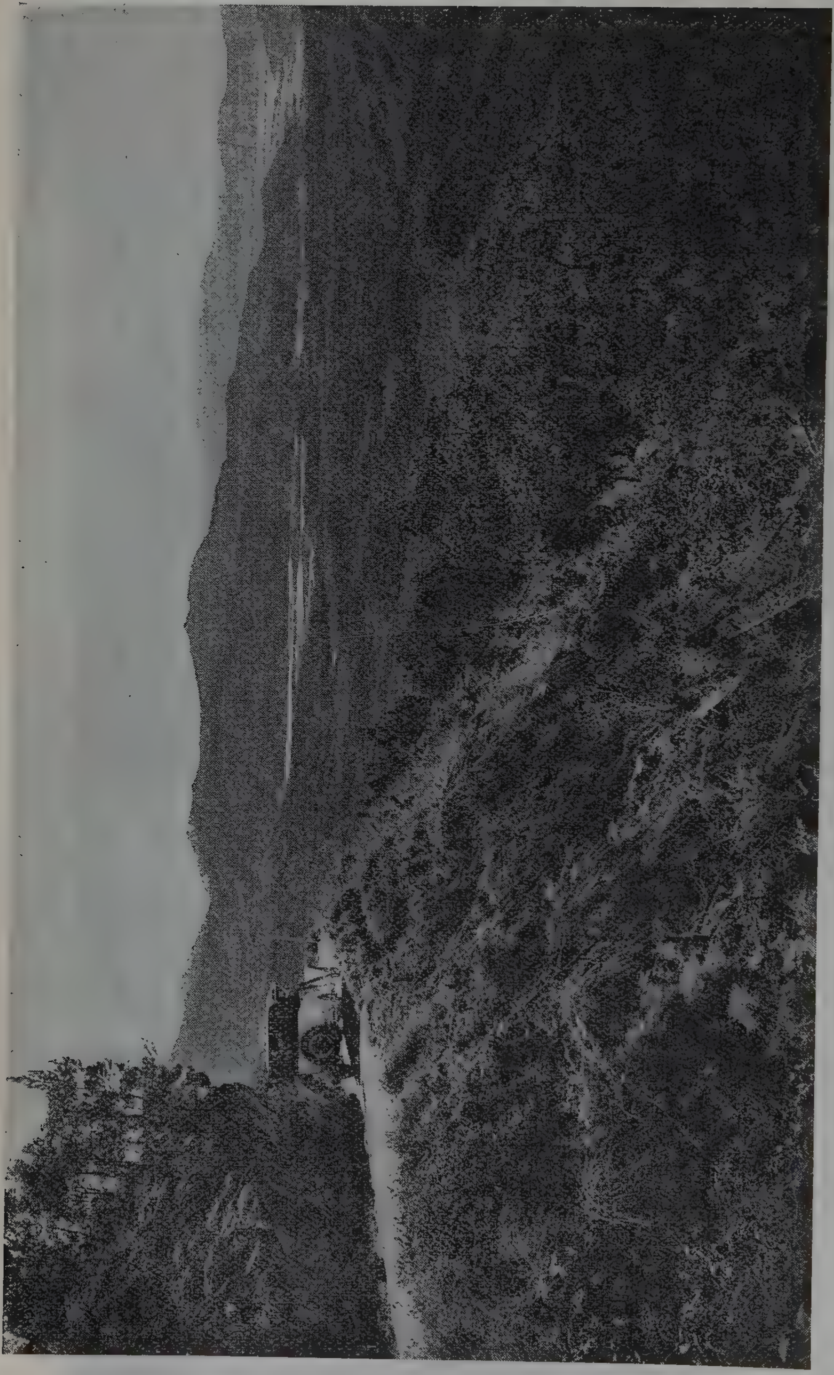

Plate 68.

View from Heale's Lookout (2,000 feet), Gillies Highway.

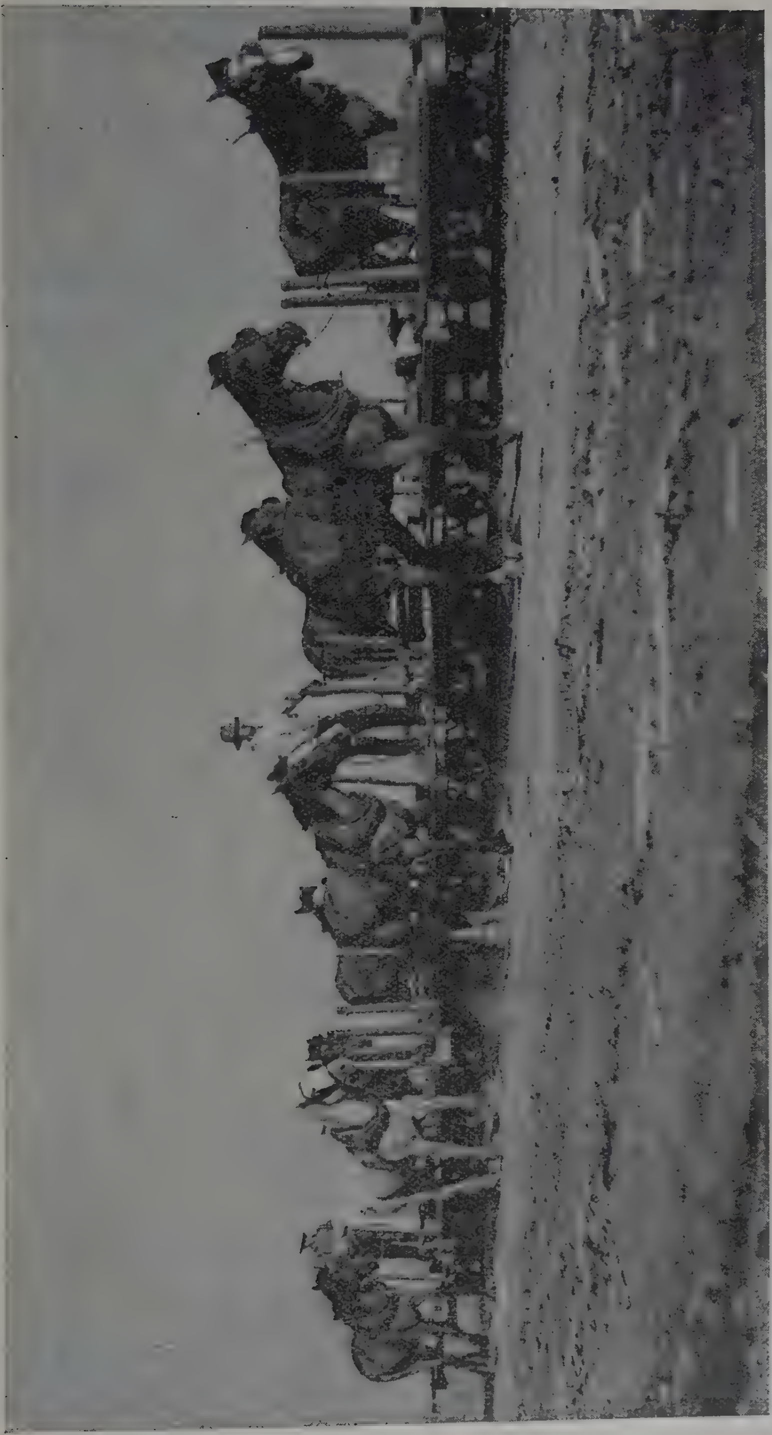

Plate 69.

A Cane Tram in a North Queensland Sugar Mill Area.

Horse power remains an economical factor in efficient farming in some sugar districts.

[Photo. by courtesy of "The Telegraph," Brisbane.

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Feather Top Grass.

H.C.Q. (Brisbane)—

The specimen collected in the Blackall district has been determined as *Chloris virgata*, feather top grass. This grass is common in Eastern Queensland, and, although it looks very tempting, stock, as a rule, will not touch it. The light seeds are easily blown about by the wind, and the grass has become a pest in lucerne paddocks, considerably reducing their carrying capacity. It has been reported that stock are fond of it when cut and made into hay.

Hop Clover.

C.S.C. (Mackay)—

The specimen collected in the Eungella district has been identified as hop clover (*Trifolium procumbens*). This is an annual clover which is reported to be palatable. It often grows on fairly poor soils. It is inferior to the ordinary white clover.

Cape Cotton.

G.H.R. (Kaimkillenbun)—

The specimen is Cape cotton or balloon cotton (*Gomphocarpus fruticosus*), a native of South Africa, but now a common naturalised weeds in parts of Queensland and New South Wales. It is often in great abundance in newly cleared scrub country, and at times we have seen it almost as thick as inkweed and some other well-known plants. It is capable of becoming quite a pest. It belongs to a dangerous family of plants, Asclepiadeæ, but, generally speaking, so far as we have observed, stock seem to avoid it or not eat it in sufficient quantity to cause trouble.

Smooth-leaved Stinging Tree.

J.R. (Beaudesert)—

The specimen represents the smooth-leaved stinging tree, *Laportea photiniphylla*, a very common tree in scrubs of coastal Queensland. It is not known to possess any harmful or poisonous properties when eaten by stock. It is, we think, the least virulent of all the stinging trees, but of course the stinging hairs cause a good deal of irritation. These are more abundant on older trees than the younger ones. We would be pleased to report on any weeds you care to send or of which you are suspicious.

Tree Lucerne.

H.C.K. (Mareeba, N.Q.)—

The plant generally grown in Australia as tree lucerne is Tagosaste, a species of Cytisus. This is grown on a fairly large scale in New South Wales and Victoria, and to a somewhat limited extent in Queensland on the Darling Downs. Seeds are listed in Arthur Yates and Co.'s catalogue at 1s. 6d. per ¼ lb. If your land is fairly high, we think it would grow at Mareeba, and is worthy of a trial. The seed should preferably be sown in autumn in prepared boxes or seed-beds, and later the plants can be transplanted to their permanent positions.

The true tree lucerne (*Medicago arborea*) is grown only to a very limited extent in Queensland, and we have not seen a single plant. Seed is procurable from Messrs. A. Yates and Co., Sussex street, Sydney, at 2s. 6d. per oz., but if you only want a small packet for trial, we have no doubt they would put up small packets of both sorts for you. Probably this would be best sown in its permanent position, but most of these plants transplant if care can be taken.

Plants from Mount Isa District Identified.

T.H.D. (Oban, Mount Isa)—

1. *Euphorbia Drummondii,* the caustic creeper. A very common weed in Queensland. On the whole, paddock stock, when they do eat the plant, seem to suffer little or no ill-effects from it. With travelling stock, however, much trouble has been reported. In New South Wales tests with the plant have on many occasions given a positive reaction for the presence of a prussic-acid-yielding glucoside, but repeated tests with the Queensland specimens have always given negative results, and the symptoms described by experienced stockowners in Queensland are certainly not those of prussic-acid poisoning. The head and neck of affected animals swell considerably. If the swelling be pierced, an amber-coloured fluid exudes and the life of the beast may be saved.
2. *Fugosia australis,* a plant of the mallow family closely allied to hibiscus. Not known to possess any poisonous or harmful properties.
3. *Cassia Sturtii.*
4. *Cassia desolata.* Species of cassia in Western Queensland are commonly called turkey bush. The senna leaves of commerce are yielded by different species of cassia, and most of them, including our native ones, of which we have a number, possess purgative properties.
5. *Sphæranthus hirtus.* A very common western weed, for which we have not heard a local name. It is not known to possess any harmful properties, but we cannot say we have ever seen stock eat it.
6. *Cassia* sp. Not known to have any harmful properties.
7. *Ipomœa plebeia.* Not known to possess any poisonous or harmful properties, but the vines of these plants sometimes cause impaction.
8. Leaves only. Seed-heads required for determination.
9. *Aristida prœalta,* a three-awned or three-pronged spear grass.
10. *Pappophorum* sp., a species of whiteheads.
11. *Chenopodium rhadinostachyum.*
12. *Helichrysum ramosissimum,* a small everlasting. The flower-heads are sometimes said to cause impaction by forming balls in horses and cattle.
13. *Trichinium alopecuroideum.* Trichinium is a large genus very abundant in Western Queensland. We have not heard a particular name applied to your species, but it belongs to the amaranth family (Amarantaceæ), and is generally regarded as quite good fodder.
14. *Pterigeron odorus.* This has been accused at odd times of being poisonous to stock, but nothing definite is known about it. It is a strong-smelling herb, and we doubt if stock eat it to sufficient extent to cause trouble.
15. *Malvastrum spicatum,* a very common mallow throughout the whole of the West. We have not, however, heard a common name applied to it. It is thought that it may be associated with ''staggers'' or ''shivers'' in sheep, but this has not been proved.
16. *Abutilon otocarpum,* a native plant of the mallow family not known to be harmful in any way.
17. *Pterocaulon sphæranthoides.* We were very pleased to receive this specimen, as we had not had it previously from Queensland, although allied plants very similar to it have been received.
18. *Atriplex* sp., a saltbush. Seeds required to determine the species.
19. Specimen too fragmentary for determination.
20. *Sarcostemma australe,* the caustic vine. This plant has been accused of poisoning stock at odd times, although at other times we have heard of stock eating it freely without any ill-effects following. Feeding tests recently carried out, however, definitely prove the plant to be poisonous.

Blue Berry Ash.

T.C. (Wynnum West)—

The specimen represents *Elæocarpus obovatus,* the blue berry ash, a small tree and a native of coastal Queensland. It is very handsome when either in flower or fruit, and when in flower we have seen bees working it very assiduously.

Plants from Pialba District Identified.

J.A. (State School, Dundowran, Nikenbah, Pialba Line)—Your specimens have been determined by Mr. S. L. Everist, Assistant to Botanist, as follows:—

1. *Aristida gracilipes,* a three-pronged or three-awned spear grass. Most of the spear grasses are rejected by stock, and this seems to be no exception.
2. *Eragrostis parviflora,* weeping love grass; fairly common in the average native mixed pasture.
3. *Eragrostis elongata,* a love grass. Most of the love grasses are regarded as fair fodders.
4. *Cyperus polystachyus,* a sedge; not a true grass.
5. *Rhynchelytrum repens,* red Natal grass; an African grass now very common in coastal and sub-coastal Queensland. Stock do not seem to be particularly fond of it, though if it is chaffed up they eat it readily enough.
6. *Echinochloa crus-galli,* barnyard millet; common in Queensland as a weed of cultivation and in rather damp situations. It is a good fodder, and is closely allied to the well-known cultivated fodders Japanese millet and white panicum.
7. *Eragrostis Brownii,* love grass; common in the native mixed pasture, and usually regarded as a fair fodder.
8. *Eleusine indica,* crowsfoot grass; common in Queensland as a weed of cultivation, along roadsides, &c. Stock seem to eat it readily, and it has a high food value. However, it contains at times a prussic-acid-yielding glucoside, and if eaten in quantities by hungry stock would probably cause trouble.
9. *Paspalum dilatatum,* common paspalum. This is the chief dairying grass of Queensland. It is a native of Uruguay.
10. *Sisyrinchium micranthum.* Not a grass, but a member of the iris family, *Iridaceæ.*
11. *Cyperus* sp., a sedge; not a true grass.
12. *Digitaria* sp. The genus *Digitaria* is at present under review at the Royal Botanic Gardens, Kew. It includes a number of Queensland grasses of no particular consequence.
13. *Poa annua,* goose grass; common as a weed in shady places, particularly during the winter and early spring months. Two specimens of this were sent, and since you may not have a duplicate, one of them is returned herewith.
14. *Themeda australis,* kangaroo grass; very common in Queensland. It is quite a good fodder in its early stages, but becomes rather harsh when mature. Stocking causes it to disappear very quickly.
15. Not received.
16. *Bromus unioloides,* prairie grass; a winter and early spring grass fairly common in Queensland. It is a native of the Mediterranean region, and is a good fodder.
17. *Entolasia marginata,* a native grass about which we have little information.
18. *Sporobolus Berteroanus,* Parramatta grass; a very common grass in Queensland. It is usually rejected by stock.
19. *Apium leptophyllum,* wild carrot; a common weed in Queensland.
20. *Sorghum verticilliflorum,* an African grass now common as a weed of cultivation in Queensland. In its young stages it contains a prussic-acid-yielding glucoside.
21. *Pennisetum clandestinum,* kikuyu grass; a native of Africa which has come into favour of recent years as a dairy grass. If it invades cultivation it can be a serious pest, but in the pasture it seems to be a desirable grass.
22. *Imperata cylindrica,* var. *Koenigii,* blady grass; very common in Queensland. In cultivation it is a very serious aggressive weed, and is difficult to eradicate. Stock generally reject it, though recently we have heard one or two good reports upon it.
23. *Panicum fulgidum,* a native grass of no particular consequence.
24. *Digitaria marginata,* summer grass; a very common weed in Queensland. Cattle seem to be fond of it.

25. *Paspalidium* sp. Most of the *Paspalidium* grasses are good fodders.

26. *Sorghum leiocladum*, a native grass about whose properties little is known.

26A. *Cyperus gracilis*, a sedge; not a true grass. Specimen is returned herewith.

27. *Axonopus compressus*, broad-leaved carpet grass. This and the narrow-leaved carpet grass (particularly the latter) are causing grave concern to some dairy farmers in coastal Queensland. For sandy coastal land they seem to have some value, but if they invade paspalum pastures they become a serious menace.

28. *Panicum fulgidum*. See No. 23.

29. Leaves only. Impossible to determine in the absence of seed-heads.

30. *Sorghum halepense*, Johnson grass; a very bad pest in cultivation, and one which is difficult to eradicate.

31. Not received.

32. A grass. Impossible to determine in the absence of seed-heads.

35. *Digitaria* sp. See remarks on No. 12.

40. *Chloris Gayana*, Rhodes grass; a native of Africa now widely grown in Queensland for dairy cattle. It is particularly valuable for scrub burns and for hilly country where ordinary paspalum will not thrive. It is sown extensively in the sub-coastal belt.

Fuchsia Bush. Berrigan.

S.H.C. (The Gums, via Dalby)—

The bush with the shorter leaves which you suspect of poisoning your sheep is the fuchsia (*Eremophila maculata*), fairly common in parts of Queensland. This plant contains a prussic-acid-yielding glucoside, and if eaten heavily by hungry sheep there is no doubt it will cause death. There is a good deal of controversy about this plant, some graziers declaring that their stock, both cattle and sheep, eat it freely without any ill-effects, There is no doubt, however, that the plant contains a poisonous glucoside and is dangerous. We have not had many tests as to the periodic occurrence of the poisonous body, but as far as we have gone it seems to be most abundant in the winter.

The other plant with longer leaves growing on the sandy country is *Eremophila longifolia*, the Berrigan, a very common shrub in some parts of Queensland and generally regarded as quite a good fodder. It is not known to possess any poisonous or harmful properties.

Palmwoods Plants Identified.

C.F.A.R. (Palmwoods)—

1. *Paspalum* sp. This is different to any we have previously received, and seems to be a new introduction. At first we thought it might be a form of No. 3, but found it is quite distinct. Could we have another specimen? We may have to send the one you forwarded to the Royal Botanic Gardens, Kew, England, for correct identification.

2. *Brachiaria miliaformis*, a native grass, and one of our best fodders. Although a native species, it seems to prefer country that has been under cultivation or broken in some way rather than the ordinary pasture. It is a species of panic grass, but we have not heard a popular name applied to it.

3. *Paspalum paniculatum*, Russell River grass. This grass is very common in parts of Northern Queensland, and, generally speaking, is not regarded very highly as a fodder—that is, compared with some grasses, such as paspalum and kikuyu. Horses are particularly fond of the seed-heads. It might be worth trying on Bribie Passage country.

4. *Gomphrena decumbens*, Gomphrena weed, a weed that is supposed to have been accidentally introduced in Townsville with fodder for circus elephants, and now widely spread throughout the coastal district. It is not a true grass, but belongs to the family Amarantaceæ. It is regarded as a good fodder.

5. There are no seed-heads, which are essential for identification. We see one you send has some nice young shoots, and we will plant this to try and produce seed-heads for identification.

Yellow Oleander.

R.F.W. (The Caves)—

The specimen represents *Thevetia nertiifolia*, a native of India sometimes known as the yellow oleander. We should say it is quite likely that the fruits caused the death of your pigs, as the tree is known to possess poisonous properties. It is often grown because it makes rather a shapely bush or tree and stands a good deal of dry weather.

Japanese Millet. Stink Grass. Caustic Creeper.

D.K.C. (Glenmorgan)—

1. *Echinochloa crus-galli*, sometimes called Japanese or barnyard millet; a palatable grass which grows in damp situations. It has a high reputation for fodder value.
2. *Eragrostis cilianensis*, stink grass. It appears to be eaten by stock only to a limited extent.
3. *Euphorbia Drummondii*, caustic creeper. This has been known to cause death to stock if eaten in large quantities. The chief symptoms are swelling of the head and neck.

Grasses from Maryborough District Identified.

R.D.W. (Tinana, *via* Maryborough)—

1. *Capillipedium parviflorum*, var. *spicigerum*, a variety of scented top grass; a native of Queensland common in forest country. In some parts of the State it is regarded as an excellent fodder.
2. *Eleusine indica*, crowsfoot grass; usually found as a weed of cultivation, on roadsides, &c. Stock like it, and it is quite nutritious. However, it contains a prussic-acid-yielding glucoside, and if eaten in quantities by hungry cattle would probably cause trouble.
3. *Brachiaria foliosa*, a native grass sometimes called the leafy panic grass. It is a good fodder, but usually only favours damp situations.
4. *Bromus unioloides*, annual prairie grass; a native of North America now widely cultivated as a pasture grass, particularly for dairy cattle, and is quite naturalised in Queensland. When not cultivated it is usually found as a weed in home gardens or anywhere where the ground has been disturbed. It comes up during the winter months and dies off with the heat of summer.

Native Millet. Clove-strip.

G. McK. (Blackall)—

1. *Echinochloa Turneriana*, sometimes called native or western millet. It is a very robust summer-growing grass, a native of wet places in Central-West and North-Western Queensland. It is very closely allied to such well-known cultivated fodders as Japanese millet and white panicum, and is worth encouraging.
2. *Jussiæa repens*, clove-strip or willow primrose. It is a native of the eastern States of Australia, extending through New Guinea to India. As you say, it is a rather difficult plant to get rid of, but we know of no other way than raking it on to the banks.

Carpet or Mat Grass.

E.S. (Dalrymple Heights, Eungella)—

The specimen is *Axonopus compressus*, sometimes called *Paspalum compressum*, carpet or mat grass. There has been a good deal of controversy about this grass in Queensland and the Northern Rivers district. No doubt if it gets into a paspalum pasture it is somewhat of a pest, but it has some value in second-class country. In reply to your query we say definitely that the grass is of nothing like the value to stock as ordinary paspalum.

General Notes.

Staff Changes and Appointments.

Mr. W. A. G. Haylott, Wendell street, Galloway's Hill, Norman Park, has been appointed an Inspector under the Dairy Produce Acts, the Diseases in Stock Acts, and the Slaughtering Act, Department of Agriculture and Stock.

Mr. C. E. Daye, Chief Attendant, Goodna Mental Hospital, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. F. A. Manning, Acting Clerk of Petty Sessions, Ayr, has been appointed an Agent of the Central Sugar Cane Prices Board and Chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards during the absence on leave of Mr. A. N. Taylor.

Mr. A. Palk, Secretary of the United Fruitgrowers' Co-operative Association, Limited, Glass House Mountains, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Constable C. A. D. Loch, Kajabbi, has been appointed also an Inspector under the Slaughtering Act.

The Officer in Charge of Police at Ravenshoe has been appointed also an Acting Inspector of Stock.

Messrs. J. V. Smith and E. W. Ladewig, Inspectors of Dairies, have been transferred from Dalby to Murgon, and Murgon to Dalby, respectively.

Mr. A. W. Hay, "Palm Tree," Taroom, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Acting Sergeant T. Jenks (Silkwood), and Constables T. R. Lipp (Coomera) and J. B. Campbell (Kalbar) have been appointed also Inspectors under the Slaughtering Act.

Mr. James Turner, Finch Hatton, Mackay, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Carandotta and Wolga Holdings Road to be a Stock Route.

An Order in Council has been issued under the Diseases in Stock Acts declaring that part of the Boulia-Urandangi road within Carandotta and Wolga Holdings to be a stock route for the use of travelling stock.

Dairy Products Stabilisation Boards.

Regulations have been issued under the Dairy Products Stabilisation Act relative to the appointment of the second and subsequent Dairy Products Stabilisation Boards under such Act. The present Board consists of all the members of the Butter Board and two members of the Cheese Board with the Director of Marketing, but the personnel of the second or future Boards shall be made up of three persons nominated by the Queensland Butter Board who, at the date of such nomination, are members thereof, one person nominated by the Cheese Board who is in office as a member of such Board, and the Director of Marketing.

The Fertilisers Act.

Following on the passing, last session, of "*The Fertilisers Act of* 1935," a Proclamation has been issued bringing the Act into operation as from the 9th January, 1936, and Regulations have been approved of which will give effect to the provisions of the Act.

Toowoomba Animals and Birds Sanctuary.

An Order in Council has been issued under the Animals and Birds Acts declaring the Middle Ridge Golf Links, Toowoomba, to be a sanctuary under and for the purposes of the abovementioned Acts. It will accordingly be unlawful to take or kill any animal or bird within the boundaries of this sanctuary.

Pool Boards Extended.

Orders in Council have been issued under the Primary Producers' Organisation and Marketing Acts extending the operations of the Butter and Cheese Boards until the 31st December, 1938, and giving notice of intention to extend the duration of the Plywood and Veneer Board for the period from 3rd May, 1936, to 2nd May, 1939. A petition for a ballot as to whether or not the lastmentioned Board shall be extended, signed by 10 per cent. of the growers of plywood and veneer, may be lodged on or before 17th February, 1936.

Assistance to Wheatgrowers.

Mr. Frank W. Bulcock, Minister for Agriculture and Stock, has received advice from the Prime Minister signifying his agreement to a basis of payment to wheatgrowers whose applications have been accepted by the State authority as being in conformity with the provisions of the "Wheat Growers' Relief Act, 1935."

Mr. Bulcock mentioned that it would be recalled that under the Act an amount of £12,000 was made available by the Federal Government for distribution to wheatgrowers in Queensland who are able to satisfy the prescribed authority that they are in adverse financial circumstances, and that in the production of crops from wheat sown by them during the year 1934 they have suffered serious loss by reason of—(*a*) specially adverse seasonal conditions; or (*b*) extensive damage to those crops arising from the prevalence of pests or diseases.

The Minister stated that the necessary action had been taken in respect to the numerous applications that had been lodged, and all approved claims were in readiness to proceed to make payment to the individual growers concerned. It is the intention to engage in the distribution of the fund with promptitude, and it is anticipated that the first batch of cheques to the wheatgrowers will be posted in the course of the next day or two.

This will be the third fund that has been made available by the Commonwealth Government to the wheatgrowers planting wheat for grain during the 1934 season. The other funds which were previously distributed by the Department represented assistance that had been provided to wheatgrowers under the "Wheat Growers' Relief Act (No. 2), 1934," and the "Wheat Bounty Act, 1934."

The aggregate amount made available to this State for distribution to wheatgrowers under the Acts mentioned was approximately £100,000.

Mr. Bulcock concluded by stating, "As far as I am aware, Queensland will be first of the States to make distribution of the several funds made available to wheatgrowers by the Federal Government."

Boundaries of Tobacco Pure Seed District.

An Order in Council has been issued under the provisions of the Tobacco Industry Protection Act further altering the boundaries of the Tobacco Pure Seed District embracing Marmor and Bajool. An extenston of the boundaries to include the parish of Archer, County of Livingstone, has been made to provide further propagation plots with suitable irrigation facilities.

Disposal of Diseased Fruit.

A regulation has been approved to-day under the Diseases in Plants Acts, regarding the disposal of diseased fruit in shops in the Granite Belt Area. The regulation provides that the occupier or owner of every shop where fruit is sold shall dispose of all diseased fruit by putting it in a 24-gauge galvanised iron bin 18 inches in diameter and 24 inches deep soldered and provided with handles and a close-fitting lid, or any other bin approved by an Inspector. The diseased fruit shall be disposed of in such place as may be approved. The regulation shall apply to the Stanthorpe, Warwick, Killarney quarantine area, and has been framed with the view of effectively dealing with the disposal of waste fruit in shops and as a step in the direction of protecting the grower from the ravages of fruit fly.

Animals and Birds Sanctuary, North Queensland.

An Order in Council has been issued under the Animals and Birds Acts declaring part of the North Queensland Coast and the Atherton Tableland to be a sanctuary under the said Acts. The sanctuary comprises the area included in the Shires of Atherton, Cairns, Cardwell, Douglas, Eacham, and Johnstone, Division 4 of the Shire of Herberton, Divisions 1 to 3 of the Shire of Hinchinbrook, and Divisions 3 and 4 of the Shire of Woothakata. It will be unlawful to take or kill any animal or bird within the boundaries of the above sanctuary.

Honorary Rangers appointed for the sanctuary are:—Messrs. L. J. Duffy, G. R. Blair, E. H. Fox, J. W. Horsford, O. Nicotra, of Mourilyan; W. J. Henderson, Coorumba (Nerada Line); P. Seassola, Silkwood; H. Sumich, Mena Creek, via Innisfail; A. Bray, Nerada, via Innisfail; S. Hutchesson, Japoon; J. Astorquia, South Johnstone; J. McFadden, Japoon; A. H. Reichardt, Silkwood; W. S. Hunter, East Silkwood; H. Spanos, private mail bag, Innisfail; and W. J. Murray, Mourilyan.

Queensland Cane Growers' Council.

An Order in Council has been issued in pursuance of the provisions of "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1935," empowering the Queensland Cane Growers' Council, in its official name, to borrow and raise money upon such terms and conditions as the Council shall think fit for the purposes of its business, and may secure the repayment thereof by mortgages, liens, or othe instruments under its official seal.

Rural Topics.

King George V. as a Farmer.

Because of his great interest in farming and stockbreeding, King George V. was held in high esteem by farmers throughout the Empire. His late Majesty was a prominent British stockbreeder, possessing studs of the leading breeds of beef and dairy cattle, of the British breeds of sheep, and of pigs. His stock won many prizes at the leading English shows, in fair and open competition with exhibits from other breeders. His interest in the progress of stockbreeding in the Empire was shown by the many exportations of stock from his studs. A large number of Autralian breeders have imported cattle, sheep, and pigs bred by the King, and importations were made by other countries, particularly Argentina.

The King thoroughly enjoyed visits to his farms, and often attended shows where his stock were exhibited. On many occasions he met buyers from other countries who visited his studs, and surprised them by his knowledge of stock and farming. He was also a breeder of thoroughbred horses.

King Edward VIII. is also a keen stockbreeder, and is the owner of a cattle ranch in Canada. His interest in farming has always been great. It is expected that with his inheritance of his late father's stud farms he will give the same encouragement to the production of the best stock.

Townspeople and Agriculture.

From my own experience I find that apart from those living in market towns and whose livelihood depends upon the purchasing power of the agricultural community, townspeople have very little idea of the difficulties that a farmer has to contend with in the course of his work.

Many people seem to labour under the delusion that a farmer is a person whose life consists of milking cows or ploughing, interspersed with spells of lamentation over the bad times with a sort of bucolic ecstasy! Little do they realise the skill necessary in managing a farm, and that a farmer to-day must combine the abilities of farmer with clerk, lawyer, vet., engineer, &c.

Another complaint is that of farmers being able to run a car when times are so bad. In this case he is at a disadvantage because whatever his reply the townsman will still criticise him. If he possesses a car then he must be prospering; should he be without one then he is accused of being out of date and failing to keep up with the times.

The great trouble in this country is that of the population regarding agriculture as an unimportant industry when compared with the iron and steel industry or textiles. Such ideas are erroneous, as the dairying branch of agriculture alone employs twice as many people as the iron and steel industry, and three or four times as many as the shipping industry.—GEORGE JARRETT, Clevedon, Somerset, in "The Farmer and Stock-breeder" (London) 11th November, 1935.

A Farrer Memorial.

Queanbeyan (New South Wales) has a memorial bust to Mr. William James Farrer, the distinguished wheat breeder. Mr. Farrer's old property, Lambrigg, where he carried out many of his experiments and where he is buried, is in the Federal Capital Territory a few miles from Queanbeyan. In unveiling the memorial the Governor-General, Lord Gowrie of Canberra, said that Farrer had been a man of vision who had seen the tremendous opportunities of wheatgrowing in Australia. It was impossible to assess the value of Mr. Farrer's work in money, but it was safe to say that it had been worth many millions of pounds. Mr. Farrer had sought no personal glory and no pecuniary reward. He had sought only the welfare of Australia and of the wheat industry.

The bust, which is by Mr. Raynor Hoff, of Sydney, is set on a sandstone plinth bearing the inscription:—"William James Farrer, Australia's world-famed wheat-breeder. Born 3rd April, 1835; died 16th April, 1906." There follow the words uttered by Mr. Farrer when he was told that he had been considered for a knighthood:—"I want only to feel, when the end comes, that my life has not been wasted."

This unassuming agricultural scientist was famous through the world as a wheat breeder. One of the varieties he bred, Federation, enriched Australia to the extent of millions of pounds, while other drought and rust-resisting types evolved by him enabled wheatgrowing to be carried on in districts which were previously not regarded as suitable for the cultivaton of that cereal. The name William James Farrer will go down in history as one of Australia's greatest benefactors.

Keep the Dairy Herd Healthy.

Most of the diseases of dairy cattle which cause extensive losses are infectious. Discussing the problem of prevention, a Departmental leaflet ("Diseases of the Udder of Dairy Cows," issued by the New South Wales Department of Agriculture) emphasises the obvious importance of seeing that no animal, unless it is known to be healthy, is placed with the herd. Usually, observes the writer, the attitude of the farmer in this connection is somewhat casual. Instead of making every effort to ascertain that a cow is not only free from disease, but also that it has not been in contact with any infected cattle, he is inclined to argue when making a purchase: "The cow looks all right—I'll take her." The animal may have had mammitis, may have aborted, may have suffered from pleuro-pneumonia, and so on, but "she looks all right," and so goes into the herd.

How is the farmer to know that a cow has not suffered from infectious disease? In reply to this the writer advises him not to buy a cow unless he can satisfy himself that it is from a herd with a clean record.

"The farmer who attends a sale and buys cattle without knowing their origin and history is weighting the scales against himself as far as disease is concerned. Many farmers taking up dairy-farming for the first time have found to their cost how easy it is to acquire unsound cattle. Further, I would advise the farmer to learn to recognise the effects of disease on stock and not to purchase any animals which show such effects. Take mammitis, for example; it almost always leaves evidence in the udder of its occurrence. The farmer who knowingly buys a cow that is a 'three-teater' or has a 'weak quarter' is buying a lot of trouble for himself."

"From the fact that he is constantly handling the udders of cows during milking operations a dairy farmer should be accustomed to the 'feel' of a healthy udder, and therefore should readily detect any change. Yet few farmers make a point of familiarising themselves with the changes that occur when mammitis attacks the cow, and they do not hesitate to buy a good-looking animal without handling the udder first. Similarly, loss of part of the tail suggests inoculation for pleuro-pneumonia, matting of tufts of hair below the vulva suggests genital infections, and so on."

Uses for Old Motor Tubes.

When the milking bails and concrete dairy are frequently washed down the concrete surface rapidly wears out the hose pipe. A simple remedy for this is supplied by the tread of an old motor tyre cut into small circular pieces in each of which is bored a hole of slightly less diameter than the hose pipe. The pieces are then threaded on to the hose and placed at intervals of a few feet, so that instead of resting on the ground the hose pipe is supported well clear. New hoses fitted in this way will last for many years.

To stop a girth from galling a horse thread the girth through an old inner tube of a motor cycle or car. This does not look unsightly, and is easily washed.

Live Stock Judges are Born—Not Made.

In judging live stock slogans may have valuable uses. For example: "No udder, now cow." Allowing the general acceptance of this maxim, the task of a judge would be rendered much easier if the absence of udder quality constituted a definite disqualification. A step further may be taken: "No constitution, no cow." And so on. But anybody who knows anything about a cow knows that the appearance of the udder, taken by itself, is not everything as an indication of productive and reproductive ability. And so, whilst slogans have definite values in directing a judge's attention to vital qualities, the determination of the degree of any disability must always remain the responsibility of the judge. What about "No foot, no horse"? Quite obviously, if a horse is hopelessly defective (constitutionally) in the feet all the good qualities above that line are useless for practical working purposes. Probably no part of a horse requires more attention—and receives less—than the foot. It may seem a long cry from the digestive organs to the feet, but not a few youngsters are ruined and rendered cripples by laminitis (fever of the feet) by being too highly fed and under-exercised to get them ready for a show. Although numerous textbooks have been written about judging live stock, every show season reveals that true judges are born, not made. The judging competitions at the shows, however, are most valuable. Having been born, the instincts of true judges have to be developed by instruction and experience.—"Himi," in the current "New Zealand Farmer."

Dry Milking More Hygienic.

Frequently discussion arises regarding the merits or otherwise of wet milking and dry milking, but there can be no doubt that the wet method—that is the continual moistening of the hands of the milkers and the teats of the cow with milk—is a dirty one. On the other hand, dry milking is not advocated, as the friction between the hand and the dry teat is uncomfortable for both the cow and the milker. Small pieces of dry scurfy skin from teats and udder are continually dropping into the bucket. When the teats and udder are washed as they should be before milking there will be just the right amount of moisture to enable the operator to work cleanly and without friction. Cows milked by the wet system are more likely to suffer from cracked and sore teats. If washing alone does not keep the teats in a soft and sufficiently supple condition during milking, a little vaseline containing 2 or 3 per cent. of boracic acid may be used upon the hands of the milker. No information regarding bacterial counts of milk drawn by wet and dry methods is available, although it is generally recognised that a purer sample is obtained by following the methods of dry milking recommended.

Prevention of Soil Erosion.

Following research into the problem of soil erosion by field officers of the New South Wales Department of Agriculture, the senior experimentalist (Mr. E. S. Clayton) has outlined measures for prevention and reclamation which will be embodied in a campaign to be launched shortly, with the object of instructing primary producers. By this means it was hoped to prevent any repetition of fruitless effort in trying to stop erosion by such methods as haphazardly throwing brush, straw, and stones into the trenches, and by diverting the water from one gully to another.

Prevention of gullying was a much easier task than reclaiming them when formed. When the lie of the land indicated where gullying was likely, contour banks should immediately be made. Contour drainage was also a vital part of the system adopted to recover gullied areas. Broadly speaking, the principle involved was to heal the surface of the soil, particularly where the erosion was most active—at the head and along the sides of the gullies. The treated area would then be protected by planting grass, shrubs, trees, or vines.

Where the drainage area was small, the trouble could be remedied by employing what was known as ''the ploughing in and seeding method.'' With very small gullies with no defined drainage area they might be filled with straw, cornstalks, or similar material, and then the sides ploughed in. The built-up passage should then be seeded to a grass suitable to the district and soil. In the case of deep gullies having gently stoping banks, or when the channel is shallow, ploughing should be commenced as near the bottom as possible, to throw the dirt towards the centre from both sides. The ploughing should be repeated until sufficient filling is obtained.

Conversely, when the sides are steep, ploughing should be commenced at the top of the gully banks. A long coupling chain should be connected to the furrow plough, and the wheel allowed to drop over the edge of the bank. When the first cultivation has reached down as far as possible operations should be repeated until oftentimes it will be possible to use a ditcher to distribute the soil over the sides and bottom. Suitable grasses, such as couch, and trees should then be planted, and temporary dams constructed where necessary to catch the soil, which otherwise might be washed away. On particularly steep land, where the gullies are deep and the cost of reclamation high, quick-growing trees, with interlacing, vigorous roots, known to suit the district, should be grown. They should be set in rows, following as far as possible the contour of the ground, and a dam made to hold the soil. Grass seed should be sown between the trees, and the area left unstocked.

Where it was desired to reclaim well-defined and actively eroding gullies, temporary dams built of brush, straw, timber, or woven wire might be suitable, though in the case of very large excavations a permanent dam of earth or concrete would be necessary. The purpose of the temporary dam was to check the water and cause it to deposit its load of silt so that the floor of the depression might be gradually built up. The permanent dam of earth would be made watertight, and provision for getting rid of excess water would have to be made with spillways or pipes. The wall, which should be built into a trench at the base, should be constructed with a scoop and plough, and should be 4 ft. at the top, with a protective layer of grass over it. Generally it would be advisable to commence making the barriers at the lower end of the gully, and when silting up had taken place to build another farther up. After reclamation the sides of the gully should be ploughed in to complete the work.

THE HOME
and
THE GARDEN

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE CHILD WHO WON'T TAKE HIS FOOD.

Among the many mothers who attend our Clinics there are a few whom it is very difficult to help. They mean so well, and they fail so completely. For them we reproduce some advice given by a children's specialist.

"Billy didn't eat and his mother couldn't understand why. She took him to a wise doctor, who found nothing physically wrong with him."

The fact that he had tantrums, was filled with fears, petty jealousies, and hatreds did not concern her nearly so much as did his poor appetite. She had hoped that the doctor might find something wrong that could be easily corrected.

She returned home disappointed, because not only did the doctor tell her that her boy was physically well, but he had refused to give her a tonic. He had frankly told her that Billy wasn't eating because of her mistakes in handling him. He had even told her that if she stopped worrying about her child's appetite her eating problems would soon disappear.

"Why, just imagine," she said to her husband in the evening, "he told me that Billy's refusal to eat was due to the same things that made him refuse to sleep and obey."

Just what was the cause of Billy's refusal to eat, and what method should the mother use in overcoming his poor appetite? In the first place, Billy was getting too much attention from the grown-ups around the home. It was suggested that he be kept outside as much as possible through the day, playing with children preferably his own age. If possible, one of his playmates was to join him in his meal. If he ate well, he was to paste a small silver or gold star in a little scrapbook, and this was to be shown to his father at the close of the day. His poor appetite was never to be discussed in his presence. If he failed to eat, nothing was to be said about it. If he showed the slightest tendency to take food he was to be encouraged and praised.

If after a week of this regimen his appetite was no better, the food was to be placed in front of him and left there for twenty minutes. If refused, it was to be taken away until time for the next meal, when the food was to be again offered him. Meanwhile he was to be denied any food between meals. There was to be absolutely no urging or scolding or begging him to eat. The whole problem was to be met in a cool, casual manner. Care was to be taken that those foods which he especially disliked were not on the tray during this period.

Love without Wisdom.

It does not seem that such directions should be especially difficult to follow, and yet it may take weeks to teach the mother to be unconcerned about feeding problems. This is very likely due to the fact that poor appetite is so intimately related to poor health. Her fear is a deep one, deeper in the anxious, worrying type of mother. Often after she has faithfully promised the doctor to carry out his suggestions and ignore the food refusal, she continues to urge and scold the offender.

The biggest job of the child worker is not to get the child to eat; it is to get the mother to stop worrying about his not eating. Perhaps the difficulty lies in the fact that the treatment is too simple. The mother will learn to her surprise that ignoring the child's appetite, at least in her case, is not so simple as she thought. She may finally realise, after she has properly learned to ignore her feeding problem, why it is that the mother who has so many children and hasn't time to worry about eating difficulties has so little trouble in getting them to eat. We have found after years of studying the food habits of the child, as so many others have found, that the problem in the physically healthy child who refuses to eat is not with the child—it is with the parents or nurse.

The Mother may find it too Difficult.

If the mother who cares for the child cannot change her attitude and ignore the food refusal, it is well to place the child in another home for a short time, and let someone else feed him. It may be a great deal easier for another person to start the ball rolling—to get the child into good food habits.

During the child's absence the mother will be able to relax, to study the situation more calmly, and will be better prepared to carry on the work that someone else has started.

It has been our experience that after such a vacation from home the mother will find that she can handle the child so much better, that his eating is very much improved—not because the child is a better child, but because he is better understood.

If your child won't eat, use tact. Don't urge, don't scold. If necessary, take food away. Don't feed between meals; and, above all, don't worry about it.

TOMATO TIPS.

Baked Stuffed Tomatoes.

Take 4 tomatoes, 1 small onion, 3 medium mushrooms, ½ oz. butter, ½ oz. dry breadcrumbs, ¼ lb. chicken livers, ½ teaspoonful chopped parsley, salt, pepper to taste, and a little lemon juice.

Remove a thick slice from the top of each tomato and scoop out the pulp. Heat the butter in a stewpan, stir in the chopped onion, brown it slightly, and add the chopped, stewed livers. Stir in the crumbs, chopped mushrooms, lemon juice, seasoning, and enough of the pulp to moisten the mixture slightly. Stuff the tomato cases with this. Cover them with the slices taken from the top and bake them. Serve the tomatoes on rounds of buttered toast, garnished with parsley.

Iced Stuffed Tomatoes.

Take 4 even-sized tomatoes, a few cooked green peas, 1 sprig mint, ½ teaspoonful sugar, lettuce, salt, pepper, mayonnaise sauce.

Cut off a slice from the soft end of the tomatoes, then stand on the stalk end and scoop out the centre very carefully. Mix it with some mayonnaise sauce. Fill the tomatoes with the cooked and flavoured green peas. Put into the ice chest until required. Stand each tomato on a lettuce leaf, pour over the prepared mayonnaise sauce, and serve.

Baked Tomato and Egg.

Take 1 egg, 1 firm tomato, 1 teaspoonful butter, salt, pepper to taste.

Cut a slice from the top of the tomato and scoop out some of the pulp. Break in an egg. Sprinkle with salt and pepper to taste, and add as much of the pulp as the tomato will hold, then put a piece of butter on top. Sprinkle again with salt and pepper and bake in a moderate oven for fifteen minutes.

Tomato Sausage Cakes.

Take the required number of medium-sized tomatoes, allow 1 small pork sausage per person, scrambled eggs.

Halve each tomato and skin each sausage, then shape the sausage meat into cakes the size of tomatoes, and flour very lightly. Fry on both sides in a little hot bacon fat and place one on each half tomato, covering with the other half tomato. Place on a buttered fireproof dish and bake till soft, but unbroken, in a moderate oven. Serve each on a hot plate surrounded by a ring of scrambled egg. Garnish with parsley and serve very hot.

Tomatoes and Cheese Sauce.

Take ¾ lb. tomatoes, 1 oz. butter, ¾ oz. flour, ½ pint milk, 3 oz. cheese, 1 egg-yolk, ½ teaspoonful (scant) castor sugar, salt and pepper.

Stalk and wipe the tomatoes, cut one in slices and the remainder in half, crosswise. Sprinkle with pepper and salt and castor sugar. Melt the butter in a saucepan, add the flour, and when blended, stir in the milk and bring to the boil. Boil this sauce gently for a few minutes, draw the pan aside, and add three-parts of the cheese, finely grated, also seasoning to taste, and the beaten egg-yolk. Pour a little of the sauce into a buttered fireproof dish, add the halved tomatoes, cover them with sauce, then sprinkle the remainder of the cheese on top. Bake gently till the tomatoes are tender, but do not let the sauce boil, then put the dish under the grill and brown the top. Garnish it with the slices of tomato, baked slightly.

Tomato Creams.

Take 1 tin tomatoes, ¼ pint cream, salt and pepper, 3 level tablespoonfuls cornflour.

Rub the tomatoes through a very fine sieve with a wooden spoon. Measure the puree and make up to a pint with water. Put the cornflour in a basin and mix smoothly with half a gill of cold water. Boil the tomato puree and pour on to the mixed cornflour, stirring all the time. Return to the saucepan, place it on an asbestos mat over a low gas, and stir for ten minutes to cook the cornflour. Season to taste and add the cream (using not quite the ¼ pint). Rinse four fancy pudding moulds in cold water and pour in the mixture. When quite cold and set, remove from the moulds and place on a dish. Garnish with watercress or finely-shredded lettuce. This is very good served with cold meat.

Tomato and Pineapple Jam.

Take 6 lb. tomatoes, 1 pineapple, 4½ lb. sugar, 1 scant teaspoonful tartaric acid.

Scald and peel the tomatoes, cut them into rough pieces, taking out the hard bits near the stalk. Cut a good-sized pineapple into small dice and boil with 1 lb. of the sugar for about twenty minutes. While boiling, heat the remainder of the sugar in the oven and add, very hot, to the boiling jam. Boil all quickly for three-quarters of an hour or until a little, dropped on a saucer to test it, shows signs of setting.

Tomato Pickle.

Take 1½ lb. green tomatoes, ½ pint vinegar, 1 oz. salt, a few cloves, allspice, and peppercorns, ½ oz. root ginger, ¼ lb. golden syrup, 3 level dessertspoonfuls brown sugar, ½ lb. onions, ¼ teaspoonful cayenne.

Wipe the tomatoes and cut into slices. Spread them on dishes, sprinkle them with salt, and leave until next day. Then pour off the salt liquor and put the tomatoes in a saucepan. Bruise the ginger and tie it in a piece of muslin with the other spices. Add these, also the golden syrup, sugar, vinegar, and onions (peeled and sliced). Boil the pickle very gently for about one hour and a-half, season it with cayenne, and, when cool, remove the spices and pot the pickle. Cover to make it airtight. This makes only a small quantity.

Through the Eyes of Youth—Friendship.

In a world in which there is so much strife, in which there are wars and rumours of wars, the League of Empire seeks to establish closer relations between the great Commonwealth of Britain and her dependencies. The League of Nations has as its objective the making of all men kin. The English Speaking Union strives to effect a more intimate relationship between the two great nations, Britain and America, which have a common tongue. A suggestion has been made that branches of the English Speaking Union should be established in schools. This idea of universal friendship is inculcated in the following extract from the "Firbank Log," the magazine of Firbank Church of England Girls' Grammar School, Brighton, Victoria. The extract from an account of the visit to the school of a Rotarian says:—

"Friendship is a thing which cannot be bought. Friendship is respect, esteem, and unselfishness—this last most particularly. He who says he hasn't a friend undoubtedly hasn't the qualities that make for friendship, which are affection and respect. Friendship is no one-sided affair—it must be mutual. A good description of a friend is one who knows all about you—the best and the worst—and can still like you. The best friendships are made at school, and friendship is necessary for the smooth working of every society. It is needed more and more in the world. Be friends with your school fellows, your teachers, and those at home. Friendships must spread, too, and be international. At the Rotary Convention in America, 1934, there were 10,000 men representing all the different countries of the world, and they were all friends. It is up to every one of us to do our best towards the making and keeping of friendships."—"The Australasian."

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Orchard Notes for March.

THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destinaion in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

During recent weeks there has been a marked increase in the banana thrips population in those districts in which this pest is well established. Growers who consider it necessary to deal with banana thrips are advised that so far nicotine dusts applied at weekly intervals have given the most promising results. The dusts may be applied by means of an inexpensive hand dust gun, or by a rotary duster to which a special flexible outlet pipe has been fitted.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green.

As blue mould is likely to cause heavy loss in coastal citrus, especially in long distance consignments, special precautions should be taken for minimising this loss. It must be remembered that the blue mould fungus will only attack bruised or wounded fruit. Hence it is necessary to be careful that no injuries are given by the clippers or finger nails during picking. Fruit should be cut and not pulled. Long stalks which may injure other fruit must be avoided.

The fruit must be carefully handled and accurately packed so as to avoid bruising. Any injured fruit should be discarded. In order to reduce the number of fungus spores present in the plantation all waste fruit in the orchard or packing shed should be collected at frequent intervals and destroyed by fire or burying.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the

Southern markets, in order to determine what fruit has been attacked by fruit by, and also to enable bruised or injured fruit liable to blue mould to be removed prior to despatch.

Growers are reminded that the control of the bronze orange bug is best achieved by spraying with the resin-caustic soda-fish oil mixture normally either late in March or early in April. Applied at this time of the year the spray can give a mortality of 98 per cent. of the bronze bugs which are then present solely in the very young stages. This spray is also very effective against several of the important scale insects infesting citrus.

Red scale is a pest to which citrus growers will shortly have to give attention, it being considered that control is best established from the middle of March to early in April. Fumigation with hydrocyanic acid gas is most effective against red scale, but success may also be achieved with white oils or with the resin-caustic soda-fish oil mixture evolved for the control of the bronze orange bug. Red scale, of course, is pre-eminently a pest of the hotter drier citrus districts.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where the potato crop is subject to Irish blight it is advisable to spray the plants for the control of this disease. Bordeaux mixure of 4.4.40 strength should be applied at least three times at intervals of ten days to a fortnight, commencing when the plants are about six weeks old.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for thirty-six hours and subsequently aerated and stored in airtight containers. The germination of the maize is not normally affected by this treatment if dry and mature when treated.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early-planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full cave and held in position by means of weighted wires.

HERD-TESTING.

To dairy farmers who really wish to improve the productiveness of their dairy herds, attention is called to the fact that the Department of Agriculture is still carrying out herd recording work.

While many thousand cows are at present under test in all parts of the State, the numbers submitted this season are considerably below those of recent years. The adverse season is, no doubt, responsible to a great extent for the falling off, but the recent rain has improved conditions in most districts, and owners should not delay in taking up the herd testing once more.

That there can be no definite improvement in any herd without herd recording has been proved beyond dispute, not only in this State, but in every dairy country in the world. The keeping of a pure-bred sire is, no doubt, a step in the right direction, but the improvement will be disappointing unless the herd is subjected to the Babcock test.

The Department is desirous of assisting dairy farmers in this matter and, as the testing is entirely free of cost, they should take full advantage of the scheme.

In comparison with other States the average production per cow in Queensland in very low, and it behoves our dairymen to face the position seriously.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1935.	Dec., 1934.
North Coast.	In.		In.	In.
Atherton	7·39	34	1·21	0·69
Cairns	8·89	53	0·62	1·45
Cardwell	8·33	63	0·53	1·35
Cooktown	6·74	59	0·12	1·03
Herberton	5·79	49	2·58	1·94
Ingham	7·05	43	1·04	0·77
Innisfail	11·98	54	1·36	0·39
Mossman Mill ..	10·75	22	0·70	0·17
Townsville	5·56	64	0·50	0·80
Central Coast.				
Ayr	4·02	48	0·28	0·13
Bowen	4·43	64	0·37	1·50
Charters Towers ..	3·32	53	1·34	0·22
Mackay	7·18	64	1·48	2·07
Proserpine	7·93	32	3·12	2·29
St. Lawrence ..	4·82	64	1·69	5·41
South Coast.				
Biggenden	4·72	36	4·58	9·04
Bundaberg	5·07	52	9·32	5·21
Brisbane	4·95	83	3·63	9·82
Caboolture	5·33	48	4·47	7·16
Childers	5·67	40	6·93	4·99
Crohamhurst	7·30	42	8·30	6·18
Esk	4·75	48	4·60	6·71
Gayndah	4·19	64	6·19	6·84
Gympie	6·07	65	6·57	8·11
Kilkivan	4·58	56	6·45	8·40
Maryborough ..	5·12	64	5·51	6·96
Nambour	6·98	39	4·97	7·65
Nanango	3·86	53	2·91	5·45
Rockhampton ..	4·83	64	5·85	3·55
Woodford	5·66	48	4·88	4·00
Central Highlands.	In.		In.	In.
Clermont	3·88	64	1·73	0·91
Gindie	2·81	36	2·97	1·85
Springsure	3·26	66	3·23	5·50
Darling Downs.				
Dalby	3·31	65	5·01	8·43
Emu Vale	3·54	39	2·40	5·37
Hermitage	2·94	29	3·18	3·50
Jimbour	3·29	47	2·92	7·88
Miles	3·17	50	2·56	8·37
Stanthorpe	3·59	62	3·34	6·47
Toowoomba ..	4·46	63	2·66	7·38
Warwick	3·42	70	3·55	5·07
Maranoa.				
Roma	2·54	61	2·08	4·70
State Farms, &c.				
Bungeworgoral ..	3·01	21	..	4·95
Gatton College ..	3·71	36	5·29	5·62
Kairi	6·30	21	..	1·80
Mackay Sugar Experiment Station	8·24	38	1·66	1·82

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—DECEMBER, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·81	91	72	101	14, 23	61	15	12	1
Herberton	..	89	63	96	12, 13, 23	53	14	258	7
Rockhampton	29·87	92	71	103	21	65	1, 2	585	10
Brisbane	29·92	85	68	97	21	61	15	363	9
Darling Downs.									
Dalby	29·87	89	65	97	11, 20, 24	52	22	501	8
Stanthorpe	..	82	57	91	20	40	22	334	11
Toowoomba	..	83	61	95	25	47	22	266	8
Mid-Interior.									
Georgetown	29·81	100	76	105	21	60	14	77	6
Longreach	29·79	102	71	115	20	61	23, 4	36	3
Mitchell	29·83	95	65	108	11, 20	53	5, 23	56	3
Western									
Burketown	29·80	98	77	107	13	68	16	130	4
Boulia	29·81	102	73	114	10, 20	64	23	15	1
Thargomindah	29·83	96	70	116	19	60	5	119	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February. 1936.		March. 1936.		MOONRISE. Feb. 1936.	MOONRISE. Mar., 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·25	6·47	5·46	6·24	1·34	1·27
2	5·25	6·47	5·46	6·23	2·34	2·20
3	5·26	6·46	5·47	6·23	3·33	3·9
4	5·26	6·45	5·47	6·22	4·25	3·49
5	5·27	6·45	5·48	6·21	5·10	4·26
6	5·28	6·44	5·48	6·21	5·51	5·0
7	5·28	6·44	5·49	6·20	6·27	5·30
8	5·29	6·43	5·49	6·19	6·59	6·0
9	5·30	6·42	5·50	6·18	7·28	6·29
10	5·31	6·42	5·50	6·16	7·58	7·0
11	5·32	6·41	5·51	6·15	8·27	7·32
12	5·32	6·40	5·51	6·14	8·58	8·8
13	5·33	6·39	5·52	6·12	9·30	8·45
14	5·34	6·38	5·52	6·11	10·8	9·29
15	5·35	6·37	5·53	6·10	10·47	10·19
6	5·36	6·36	5·54	6·8	11·35	11·14
17	5·36	6·36	5·54	6·7		
					a.m.	a.m.
18	5·37	6·35	5·55	6·6	12·27	12·11
19	5·38	6·34	5·55	6·5	1·25	1·15
20	5·38	6·33	5·56	6·4	2·27	2·18
21	5·39	6·32	5·56	6·3	3·34	3·24
22	5·40	6·31	5·57	6·2	4·41	4·31
23	5·40	6·30	5·57	6·1	5·50	5·39
24	5·41	6·29	5·58	6·0	6·56	6·47
25	5·42	6·28	5·59	5·59	8·3	7·57
26	5·43	6·27	5·59	5·57	9·10	9·8
27	5·43	6·26	6·0	5·56	10·18	10·15
28	5·44	6·25	6·0	5·54	11·24	11·18
					p.m.	
29	5·45	6·24	6·1	5·53	12·28	12·15
30			6·1	5·51		11·6
31			6·2	5·50		1·51

Phases of the Moon, Occultations, &c.

7 Feb.	○	Full Moon	9 19 p.m.
16 ,,	☽	Last Quarter	1 45 a.m.
23 ,,	●	New Moon	4 42 a.m.
29 ,,	☾	First Quarter	7 28 p.m.

Apogee, 12th February, at 4.6 a.m.
Perigee, 24th February, at 8.24 a.m.

About 3 hours after setting, about 4.40 p.m., Venus will become occulted by the Moon to observers situated in the Northern Hemisphere, north of parallel 49 degrees.

Mercury will reach its greatest elongation, 27 degrees west of the Sun on the 26th. It will then rise 1 hour 55 minutes before it, affording a good opportunity to be seen by early risers. Venus and Mercury will then be apparently in Capricornus, about 3 degrees (half length of Cross) apart.

Mercury will set only 5 minutes before the Sun on the 1st: on the 14th it will rise at 3.54 a.m., 1 hour 40 minutes before the Sun.

Venus rises at 2.39 a.m., 2 hours 46 minutes before the Sun, on the 1st, and at 2.57 a.m., 2 hours 37 minutes before it on the 14th.

Mars sets at 8.32 p.m. on the 1st and at 8.8 p.m. on the 14th.

Jupiter rises at 1.28 a.m. on the 1st and at 12.45 a.m. on the 14th.

Saturn sets at 8.22 p.m. on the 1st and at 7.34 p.m. on the 14th.

It will be noticed that Mars and Saturn will be apparently nearer to one another on the western horizon on the 1st, when Mars will set only 10 minutes after Saturn, but on the 14th it will be 34 minutes later.

The path of the Moon in February, commencing at 8 p.m. on the 1st will be :—In Taurus, just above the Pleiades, that beautiful group of six small stars in the left shoulder of the Bull, so modest and so easily deciphered, which may be seen as seven or even twelve stars by persons with very keen sight. The number, however, reaches a hundred in moderately powerful telescopes. The Moon will reach Gemini on the 3rd and Cancer on the 6th, passing above Castor and Pollux. Reaching Leo on the 7th it passes above Regulus on the 8th, crossing the border of Virgo on the 11th, and passing above Spica at 10 a.m. on the 13th. It will reach Libra on the 14th, Scorpio on the 16th, and will be in Orphincus till the 18th, in Sagittarius till the 21st, in Capricornus till the 22nd, in Aquarius till the 24th, and pass below Saturn near midnight on the 23rd. It will be in Piscus till the 27th, in Aries till the 28th, and again in Taurus until the end of the month.

The Southern Cross does not come into view till after 7 p.m. on 1st February but will appear an hour earlier on the 16th. It will be visable all night during this month.

8 Mar.,	○	Full Moon	3 13 p.m.
16 ,,	☽	Last Quarter	6 35 p.m.
23 ,,	●	New Moon	2 13 p.m.
30 ,,	☾	First Quarter	7 22 a.m.

Apogee, 10th March, at 2.18 p.m.
Perigee, 23rd March, at 7.24 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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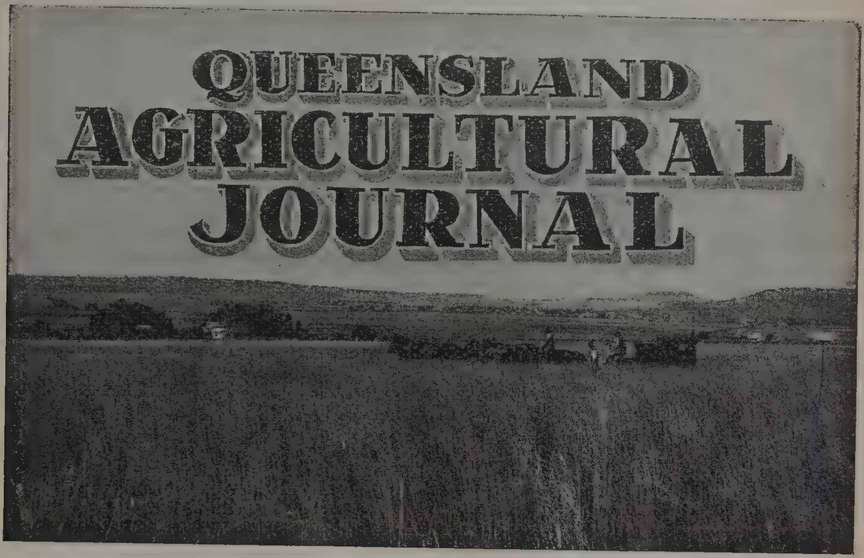

VOL. XLV. 1 MARCH, 1936. PART 3

Event and Comment.

A King Speaks to His People.

"THIS is London—London calling to the Empire at home and overseas!" That call went out to the Empire on Sunday, 1st March, and was heard distinctly in all parts of Queensland. It was preliminary to an address by His Majesty King Edward VIII. to his people in all parts of the British Empire. The King's speech was profoundly impressive, and was such that every one who heard it had a right to feel that it was directed to him personally.

> His Majesty the King said—
>
> It has been an ancient tradition of the British monarchy that the new sovereign should send a written message to his peoples. Science has made it possible for me to make that written message more personal and to speak to you all over the radio. This, however, is no innovation, for my father has for the last few years spoken to his peoples at Christmas time. A little more than two months ago he broadcast his last Christmas message. To many of you the sound of his voice must still seem to be ringing in your ears. He was speaking then at the close of a long and wonderful reign, which covered a period of twenty-five years, during which unprecedented changes have taken place and great anxieties and problems have been shared by all.

Throughout his reign he set a high example of constant devotion to duty, and he was ever concerned for the welfare of his subjects and of all those under his protection. In times of adversity his calm confidence was an inspiration to all his people, and he shared in their joys as well as in their sorrows.

I know how, in the Dominions, in India, in the Colonies, and the dependencies the bond of loyalty to the Crown—that symbol of the unity of many lands and populations—has been strengthened by a tie of personal devotion to my father. I feel that his death is not only an overwhelming grief to my mother and to us, his children, but that it is at the same time also a personal loss to you all. To the princes and the peoples of India I tender my greeting as King-Emperor. The manifestations of your sorrow and of your loyalty at this time have been a source of deep gratification to me. Associations in peace and in war between the British and Indian peoples have been long and honourable, and the example set by Queen Victoria, King Edward the Seventh, and King George the Fifth lays on me, as their successor, a solemn trust to maintain and strengthen these associations.

Queen Mary, my family, and myself have been greatly helped by the world-wide tributes of genuine sorrow which we have received from every side. Vast crowds assembled reverently at the funeral. Homage to the late King's memory and written words of sympathy by thousands of people, not only those resident within the British Empire, but in many foreign countries as well, are things that we will never forget. It is wonderful for us to know how universally my father's great qualities have been appreciated and valued. It is no mere form of speech to say that he reigned in the hearts of his people. And it was his happiness to know before he died that his long years of unstinted service were rewarded by a devotion and an affection so perfectly expressed in the Jubilee demonstrations of last year.

It falls upon me to succeed him and to carry on his work. I am better known to most of you as the Prince of Wales, as the man who, during the war and since, has had an opportunity of getting to know the people of nearly every country of the world under all conditions and circumstances. And although I now speak to you as the King I am still that same man who has that experience and whose constant effort it will be to continue to promote the wellbeing of his fellow men. May the future bring peace and understanding throughout the world, prosperity and happiness to the British people, and may we be worthy of the heritage which is ours.

A Great Act of Statesmanship.

IN the course of a broadcast address from Brisbane, His Excellency the Governor, Sir Leslie Wilson, called attention to the many manifestations of genuine grief and sympathy which had come to him from the people of Queensland when the death of King George V. was announced. His Excellency said—

It seems such a short period since the people of Queensland have been listening to his late Majesty King George.

Few, if any, of those who heard or read his words would ever forget them. In his broadcast on Christmas Day, 1934, the late King referred to the Empire as bound to him and to its units by the spirit of one great family, and had said that, if he might be regarded as in some true sense the head of that great and widespread family, it would be a full reward for the sometimes long and anxious labours of his reign, which was then well nigh of twenty-five years' duration. A year later, on a similar occasion, the late King had said that it was the personal link between himself and his people which he valued more than he could say.

We in Queensland could really say that we were a distant outpost of the Empire, and no one knew better than himself how widely and sincerely King George's death had been felt here. He had received evidences of sincere feeling from all classes of the community. He somehow felt then, and still felt, that the grief so widely expressed was really a personal grief, and the reason was to a great extent due to the fact that every one had been brought closer to the late King as a man by that great achievement of science, radio. Now his son, King Edward VIII., was going to speak in his place. It would not be an easy task, said Sir Leslie, and he was sure the people of Queensland would appreciate the great act of statesmanship.

The Guarantee of Peace.

BROADCASTING from London on 1st March, the Premier of Queensland, Hon. W. Forgan Smith, made a strong plea for universal peace. He said:—

The King came to the throne in one of the most difficult economic periods, when men starved in a world of plenty. An atmosphere of suspicion between nations complicated matters, but it could be said that the British Commonwealth of Nations was strong enough to guarantee peace, and the gaining of universal peace was our job and responsibility.

The world faced the problem of using the increase in productivity so that poverty would not exist, and one of the factors which led to war would be removed.

British industry was still in the ascendancy, and there was a strong public feeling for a reciprocity of trade between the Dominions and Britain.

The Premier stated that the retail price of sugar in Europe was so much above the normal that they could produce more than sufficient to meet the demand. This was applicable also in other commodities. If the price level of commodities could be brought down to a reasonable level there would be a shortage, not a surplus, in world production.

Restricted production was the greatest tragedy, and it was on a solution of this problem that hopes of the future and happiness during the new King's reign depended.

Irish Blight of Potatoes.

SPRAYING EXPERIMENTS AT BEENLEIGH.

By R. B. MORWOOD, M.Sc., Plant Pathologist.

THE potato crops of the coastal river flats and to a lesser extent the more inland districts of Queensland are liable to attacks of Irish blight. The disease may be prevented by an adequate spraying programme, but a considerable proportion of growers neglect this precaution. Following heavy losses in unsprayed crops in the Beenleigh district a series of spray demonstrations and experiments have been carried out in this area.

As a result it can be confidently recommended that potato crops should be sprayed with Bordeaux mixture prepared from 4 lb. of bluestone and 4 lb. of quick lime or of hydrated lime to 40 gallons of water. The first spray should be applied prior to hilling, and in a normal season this should be followed by two more applications at intervals of a fortnight. When blight is present, or in seasons favourable to its development, four or five sprays should be given at intervals of ten days.

The first experiment was started in April, 1934, under somewhat unfavourable conditions, as it was rather late in the season, and the stand and early growth of the crop had suffered from excessive rains following planting. Irish blight could be found in the plot prior to the commencement of spraying; however, two applications of Bordeaux mixture were made at intervals of ten days. While this was insufficient for complete control of the disease the difference between sprayed and unsprayed plots was striking. The tops in the sprayed plots were quite green and vigorous when those in the unsprayed sections were brown and leafless. Weighing the tubers confirmed the improvement shown in the tops. The yield of marketable potatoes from the sprayed plots was a 50 per cent. improvement on the checks.

Following this initial successful demonstration the experiment in the next crop was enlarged to include a number of materials other than the standard 4-4-40 Bordeaux mixture. This crop was only very mildly affected with blight. The disease was considerably more pronounced in several of the unsprayed plots than in those sprayed, but with the advent of dry seasonal conditions it passed over without leaving any marked reduction of yield.

On the next crop—that of autumn 1935—experiments were carried out on two potato crops at Beenleigh. The first of these, on the property of Mr. B. Spann, was designed to compare the various spray materials, including home-made and ready-mixed Bordeaux, miscellaneous copper fungicides, and two sulphur mixtures and to compare the sprays with copper dusts. The second, on the property of Mr. C. W. Luback, was divided into two portions, one designed to compare different strengths of Bordeaux and the use of English and Australian bluestone, the other to compare different spray schedules using Bordeaux mixture of 4-4-40 strength.

EXPERIMENT I.—VARIOUS FUNGICIDES.

The area selected on Mr. B. Spann's farm was of Factor potatoes with a good stand. The crop was fertilized and well worked, and put on a remarkable growth of tops. Diseases other than Irish blight did not interfere to a great extent. Although there was reason to believe that the seed was considerably infected with virus diseases, they did not appear till the crop was well developed, and made little difference to the yield. This result was attributed to high-temperature masking. Blackleg caused the total loss of plants in two small patches. Allowance was made for the estimated crop from plants killed by this disease.

The potatoes were planted about the middle of February, and the first application of sprays and dusts was made on the 19th-20th March, when the plants were beginning to flower, followed by two more applications at fortnightly intervals. All dusting was done while the dew was still on the plants. A fourth application was planned but abandoned owing to the tangled nature of the tops and the absence of blight infection at the time.

The sprays and dust are listed in Table I., which also gives the results of the experiments. Bordeaux mixture was made up by the 4-4-40 formula, using quick lime, and the other copper sprays were made to the same copper content with the exception of ammoniacal copper carbonate, bouisol, and one-half strength colloidal copper. The ammoniacal copper carbonate was made to the formula 5 oz. of copper carbonate and three pints of ammonia to 40 gallons of water. For bouisol the figures were 5 lb. to 100 gallons. Of the sulphur sprays lime sulphur was made up to ·5 per cent. polysulphide sulphur, equivalent to 1 : 26 with the particular brand used, and colloidal sulphur was used at a strength of 5 lb. per 100 gallons. Severe spray injury was caused by the ammoniacal copper carbonate. All other plots were free from this defect.

The layout of the plots involved four replications of each of the twenty treatments. Individual plots were 20 feet 5 inches long and three rows wide (1/240 acre). The arrangement was random, excepting that each treatment occurred once in each row and also occurred once in each of the four blocks of twenty plots obtained by dividing the area at right angles to the rows.

Blight did not appear till a fortnight after the third spray was applied, when the crop was nearly mature. It was first observed on the 1st May, and by the time the plots were dug (20th May) the tops in the unsprayed plots were dead and dry from the effects of the disease. The best sprayed plots were at that time quite green. The tubers were generally healthy, only an occasional one exposed to the surface being affected.

Notes were made on the plots just prior to harvest, when all the copper containing sprays and dusts with the exception of ammoniacal copper carbonate were considerably less diseased than the unsprayed. The lime-sulphur and colloidal sulphur plots were no better than the controls. Among the copper sprays six appeared to be outstanding. These were home-made Bordeaux mixture, Burgundy mixture, home-made colloidal copper, and three ready-mixed proprietary Bordeaux mixtures. The dusted plots showed a little more disease than did the best sprayed plots.

Owing to the lateness of the attack of blight, the yields did not show such marked differences between treatments as did the appearance of the tops. The figures for the yield of marketable tubers from each plot are given in Table I.

TABLE I.

——	Yield in pounds per plot.				Average Yield, tons per acre.
Bordeaux mixture	50	54	60	62	6·1
Burgundy mixture	58	49	60	62	6·1
Ammoniacal copper carbonate	31	33	22	32	3·2
Lime Sulphur	47	50	47	47	5·1
Home-made colloidal copper	54	51	44	57	5·5
Half-strength colloidal copper	50	47	39	70	5·5
Bouisol	47	51	65	65	6·1
Colloidal sulphur	30	50	63	43	5·0
Proprietary Bordeaux No. 1	68	61	48	74	6·7
Proprietary Bordeaux No. 2	51	54	66	76	6·6
Proprietary Bordeaux No. 3	50	53	48	75	6·1
Proprietary Bordeaux No. 4	59	50	71	68	6·6
Proprietary Bordeaux No. 5	53	40	63	50	5·5
Verderame	51	58	48	65	5·9
Copper carbonate	61	71	40	64	6·3
Copper dust No. 1	58	51	68	71	6·6
Copper dust No. 2	46	53	54	58	5·6
Copper dust No. 3	65	60	56	67	6·6
Copper dust No. 4	51	55	59	55	5·9
Unsprayed	49	35	43	60	5·0
	Mean				5·8
	Standard error				6·9%
	Significant difference				1·2

Statistical analysis indicated that though there were some markedly significant differences, there were not clear-cut significant differences in the yields of individual effective and non-effective treatments. The experiment was then analysed on the basis of the groups of plots shown in Table II.

TABLE II.

Group.	No. of plots.	Average yield in tons per acre.	Diff. from no copper.	Diff. S.E.
Copper sprays (no spray injury)	48	6·1	+1·1	4·0
Copper sprays (spray burn marked)	4	3·2	−1·8	4·0
Copper dusts	16	6·2	+1·2	3·8
No copper	12	5·0	..	..

From this it can be definitely stated that the plots receiving copper sprays outyielded those not receiving these sprays. Similarly the dusted plots outyielded the "no copper" plots. The difference between dusts and effective sprays was insignificant.

Discussion.

The experiment demonstrated that Irish blight can be controlled by the application of sprays. The improvement in yield of marketable tubers was over 1 ton per acre, a result in the case of the home-made Bordeaux mixture obtained by the use of 18s. worth of spray materials. The ready-mixed Bordeaux mixtures were effective, but it is to be noted that they were used at an equivalent strength to 4-4-40 Bordeaux. This necessitated the use of 1 lb. of the mixture containing the equivalent of 50 per cent. copper sulphate to 5 gallons of water. Dusting proved as good as spraying under the conditions prevailing, but observations indicated that dusts should be applied more often than sprays. Neither the ready-mixed Bordeaux nor dusts are as economical as home-made Bordeaux mixture, which must, therefore, be recommended for use on potatoes.

EXPERIMENT II.—STRENGTH OF BORDEAUX MIXTURE.

This experiment was laid out on the property of Mr C. W. Luback. The crop which showed magnificent growth in the early stages was a fortnight later than that used for the previous experiment, and blight appeared somewhat earlier. The first spray application was made on 3rd April, when a trace of blight was showing. The plots were only visited at fortnightly intervals, when they were sprayed, a total of three applications of spray being made. This interval proved too long, and during a severe visitation of blight the plots were severely affected in spite of the spray, and only remained green for two to three weeks after the surrounding unsprayed crop had succumbed.

The experiment was designed to compare three different strengths of Bordeaux mixture and two types of bluestone. Under the severe conditions prevailing any differences in effectiveness should have been reflected in the yield figures. These, however, show no significant differences. The 2-2-40 Bordeaux mixture appeared to be practically as good as the strongest used (6-4-40), and the conclusion must be reached that thoroughness of application is more important than actual strength of mixture. However, on the experience of this single trial, one would hesitate to recommend the slight economy of reduction of the strength of the mixture from the standard 4-4-40.

The yield figures obtained in this experiment are given in Table III.

TABLE III.

Treatment.	Yield in pounds per plot.			Average Yield in tons per acre.
Bordeaux (Australian Bluestone)—				
2-2-40	47	41	48	3·02
4-4-40	51	44	44	3·09
6-4-40	46	43	50	3·09
Bordeaux (English Bluestone)—				
2-2-40	51	41	42	2·98
4-4-40	54	45	47	3·24
6-4-40	49	41	52	3·38

EXPERIMENT III.—TIME OF APPLICATION.

The tests of the number of applications of Bordeaux mixture and the time they should be applied were carried out alongside Experiment II. and under the same conditions. Six schedules were planned, one to receive no spray, one to receive four applications of 4-4-40 Bordeaux mixture, starting at the time of hilling and continuing at intervals of a fortnight, and the other four schedules each omitting one of these applications. Unfortunately, as for the previous experiment, the period chosen, namely, a fortnight, was too long, and the plots did not survive to receive the fourth application. The yields from the plots are given in Table IV.

TABLE IV.

Treatment.	Yield in pounds per plot.			Average yield in tons per acre.	
No spray	24	28	26	1·73	
2nd and 3rd spray	52	39	41	2·93	
1st and 3rd spray	36	34	43	2·51	
1st and 2nd spray	38	29	45	2·49	
1st, 2nd, and 3rd spray	51	57	45	3·40	3·44
1st, 2nd, and 3rd spray	52	50	55	3·49	

S.E. 5·5%.
Signif. diff. between means of 3 = ·44 tons per acre.
Signif. diff. (Mean of 6 — mean of 3) = ·38 tons per acre.

Three sprays are significantly better than any pair of sprays. All of the spray schedules are significantly better than no spray.

While the spray applied at long intervals did not completely control the disease under the severe conditions operating, yet it made the difference between a very poor crop and a fair one. The application of three sprays nearly doubled the yield, making a difference of over a ton and a-half per acre. Had the four or five applications been made at intervals of a week or ten days there is little doubt that an excellent yield would have been obtained in spite of the very favourable conditions for the disease.

Summary of Results.

Bordeaux mixture sprays will control Irish blight of the potato. Other copper sprays, including proprietary ready-mixed Bordeaux powders and copper dusts, are effective if used correctly. Sulphur sprays do not control the disease.

In three out of four experiments the yield of sprayed potatoes exceeded that of unsprayed by 1 ton per acre or more.

Acknowledgment.

Acknowledgment is made of the assistance rendered and facilities provided by Messrs B. Spann and C. W. Luback, on whose properties the experiments were conducted.

Plate 70.

The Herbert River at Macknade, North Queensland.

[Photo. by courtesy of "The Telegraph."

PLATE 71.

Tram Tour through Cairns Cane Lands, Hambledon, North Queensland.

[*Photo. by courtesy of "The Telegraph."*

Leaf Miner and Stem Borer of Tobacco in North Queensland.

By D. O. ATHERTON, B.Sc.Agr., Assistant Entomologist.

(*Continued from January, 1936.*)

LEAF MINER AND STEM BORER COMPARED.

ALTHOUGH one species is known as the leaf miner and the other as the stem borer there is often a certain amount of leaf mining associated with stem borer activities, and often some stem injury associated with the leaf miner. Thus, the colloquial names are only calculated to emphasise the commoner method of attack by the species indicated, and not to specify the only way in which the host is damaged. The two are often found closely associated as pests of tobacco, and in the past some confusion has arisen as to whether more than one species was present (Taylor, 1917, and Edwards, 1929).

This confusion in the records, together with the close association of the species in the crop, gave rise to some speculation as to the possible occurrence of inter-specific breeding. Accordingly several experiments designed to throw some light on the matter were conducted in the laboratory. For the attempted crossing of the species one or more males of one species were segregated with a corresponding number of virgin females of the other species. The containers used for segregation consisted of large glass test tubes 8 inches in length and 1½ inches in diameter. The containers were closed by a piece of muslin stretched over the open end, and each tube contained a piece of cotton wool moistened with a sugar and water syrup.

Eggs were laid by the females of both species, leaf miners laying within from 9 to 66 days after emergence and stem borers from four to forty-seven days after emergence. The number of eggs in all cases was less than usual for the mated moths of the species, the average for the leaf miners being twenty-five and for the stem borers seventy-five. All the eggs were infertile, and the resemblance in these particulars to isolated unmated females of either species will be apparent. No attempted mating was observed between males and females of the different species and from these observations there is no reason for supposing that crossing of the two species takes place in the field.

Leaf miner adults are similar to stem borers in many respects, though they differ in others equally striking. Both are about the same size, and agree in general conformation, though the distinctive colour of the wing and body scales facilitates specific recognition of undamaged specimens. Such moths in a collection containing both sexes of both species are readily classified into two groups, the grey colour of the leaf miners presenting a marked contrast to the coppery red-brown of the stem borers. Even when the moths in such a collection have lost most of their scales the male leaf miners are readily recognised by the "kilt" of hairs near the tip of the abdomen. Females of that species, and both sexes of the stem borer are, however, indistinguishable one from another once the wing scales have been lost.

The corresponding immature stages of the two species bear a superficial resemblance to one another, though more detailed observations reveal certain differences. A close examination of the eggs by the aid of a high-power lens shows that those of the stem borer are not quite so robust as those of the leaf miner. Eggs of the former are $479 \pm 23\mu$ long by $315 \pm 13\mu$ in diameter, and those of the latter $481 \pm 33\mu$ by $349 \pm 16\mu$. Leaf miner eggs are broader in proportion to their length than those of the stem borer, and while they are oval in outline stem borer eggs are shaped more like a short cylinder with hemispheral ends. The reticulate markings on the chorion occur more constantly and generally in the stem borer. In the stem borer the colour is often a creamy yellow, but in the leaf miner it is generally pearly white or only slightly creamy.

Newly hatched larvæ of both species are similar in size and general conformation, but the head capsule and prothoracic plate of the stem borer may be lighter in colour than these parts in the leaf miner. These differences in colour become more pronounced as the larvæ approach maturity. The head of the stem borer larva varies from dark to light brown, but that of the other species is nearly always very dark brown or almost black. The prothoracic plate of the stem borer may be distinctly marked and brown in colour, or it may be indistinctly delineated and only slightly different in colour from the rest of the body. The prothoracic plate of the leaf miner is always distinctly marked. Leaf miners may be light creamy yellow, but they usually have a dirty grey or pinkish tinge, and the latter may be so pronounced as to give an almost purplish appearance. Mature larvæ of the stem borer show very little colour variation, being invariably whitish or creamy yellow. Leaf miner larvæ are often longer in the body than stem borers, even when both are full grown, but the latter are usually more robust in build.

There are only four larval instars in the leaf miner life cycle, but five in that of the stem borer. The latter insect seems to vary more widely from Dyar's constant than does the former. Temperature studies in relation to life history show that the effective day-degree requirements for the egg stage and for the pupal stage are similar in both species. For the completion of the larval stage, however, the stem borer requires that twice the number of effective day-degrees be experienced as are necessary for the leaf miner. The average requirements in effective day-degrees are here repeated for the various stages.

TABLE 9.

TEMPERATURE AND DEVELOPMENT.

Pest.	EFFECTIVE DAY—DEGREES.			
	Egg.	Larva.	Pupa.	Total.
Leaf miner	118 ± 11	351 ± 33	221 ± 20	690 ± 36
Stem borer	117 ± 9	703 ± 81	230 ± 36	1050 ± 95

The similarity of the figures for the egg stage and for the pupal stage of the two pests contrasts strikingly with the disparity of the two figures for the larval stage. The latter point is significant, as it means that under identical temperature conditions the leaf miner larva develops in half the time required for the completion of this stage in the stem borer.

Pupation by the stem borer invariably occurs within the host plant, and consequently the pupa is protected from outside agencies until the moth emerges. The leaf miner, on the other hand, pupates outside the plant, usually on the ground or in the debris at the base of the plant, but sometimes on the outside of the stem.

Eggs of both species have been found on seedlings and small plants, and there is little doubt that they are also laid by both species on larger plants in the field. Both species oviposit on either leaf surface, on the stems, and, at least in seed-beds and in the laboratory, on the soil. The leaf miner very definitely prefers the soil for oviposition, but the stem borer just as strongly favours the plants.

The newly emerged larvæ of both species often wander about on the plant for some time before entering a leaf, and both reject the epidermis when eating their way into the mesophyll. While the leaf miner habitually mines large blotches in the leaves the stem borer never excavates leaf mines of any size. The typical leaf mining of one species may be readily distinguished from that of the other. The leaf miner may desert one leaf and attack another, but the stem borer apparently invariably remains inside the plant once it has entered, though in the laboratory immature larvæ were successfully transferred from one leaf to another. Stem injury by the leaf miner in older plants is always confined to the cortex immediately under the epidermis, but the stem borer habitually penetrates through the vascular cylinder into the pith.

Both species may cause serious losses in seed-beds. The presence of the leaf miner is always obvious, but the presence of the stem borer may not be apparent until after the plant has been set out in the field and the typical gall develops. Either species may destroy all the seedlings in affected beds, but as a rule numbers of the plants escape serious attack. In the field, also, total destruction of the crop may result from severe attacks by the leaf miner or both species acting simultaneously, but such spectacular losses are not general. Stem borer alone is seldom responsible for the destruction of a whole crop. With either pest the critical stage in the field occurs during the period of suspended growth immediately after transplanting, and if the crop survives this interval disastrous losses seldom occur.

The species respond quite differently to the stimulus of light in the laboratory, for while handling moths during the life history studies it was found that both sexes of the leaf miner were positively phototropic, whereas most stem borers gave a negative response to this stimulus.

The leaf miner generally lives longer than the stem borer when maintained in similar surroundings under identical conditions of temperature and humidity. In one comprehensive series under observation in the laboratory leaf miner moths lived up to sixty days, the average being thirty-eight days, while stem borers lived only twenty-one days at the most, the average being eighteen days.

The stem borer is more fecund than the leaf miner, the average oviposition of mated females in one series being 238 and 65, respectively. Parthenogenesis has been recorded in the leaf miner previously (Pickard, 1913), but was not observed in North Queensland, though there were indications of its occurrence in the stem borer.

NATURAL ENEMIES.

The early studies of the bionomics of these pests indicated that the use of artificial control measures might prove economically unsound or quite impracticable. It was therefore considered advisable that the status of insect enemies be investigated. The importance of these beneficial species, particularly those that are parasitic, is apparently quite different in the two pests under discussion, and the following notes abstracted from "The Review of Applied Entomology" indicate the position.

Only one insect enemy, namely, an egg parasite, has been recorded elsewhere for the stem borer, whereas two egg parasites, numerous larval and pupal parasites, and several larval predators, have been recorded for the leaf miner.

The egg parasite of the stem borer is *Chelonus bussyi* Vier. (Keuchenius, 1915, and Fulmek, 1923).

The species regarded as probable egg parasites of the leaf miner are *Polynema striaticorne* Gir. and *Phanurus* sp. (Underhill, 1926). Those definitely recorded as larval or pupal parasites of the same pest are *Chelonus* sp. (Edwards, 1929), *C. blackburni* Cam. (Fullaway, 1914, and Morgan and Crumb, 1914), *C. phthorimaeae* Gahan (Poos and Peters, 1927, and Graf, 1917), *C. shoshoneanorum* Vier. (Graf, 1917), *Chelonella curvimaculata* Cam. (Wilkinson, 1932), *Campoplex (Omorgus) phthorimaeae* Cush. (Poos and Peters, 1927, Underhill, 1026, Graf, 1917, Schlupp, 1917, and Cushman, 1915), *C. ferrugineipes* Ashm. (Poos and Peters, 1927, and Underhill, 1926), *Microbracon gelechiae* Ashm. (*Habrobracon johanseni* Vier.) (Poos and Peters, 1927, Underhill, 1926, Wilkinson, 1926, Trouvelot, 1922 and 1924, Sagot-Lesage, 1923, Newman, 1922, and Graf, 1917). *Limnerium blackburni* (Fullaway, 1914), *L. polynesiale* Cam. (Morgan and Crumb, 1914), *Bassus gibbosus* Say (Poos and Peters, 1927, Underhill, 1926, and Graf, 1917), *Apanteles* sp. (Graf, 1917), *A. scutellaris* Mues. (Muesback, 1920), *A. carpatus* Say (Underhill, 1926), *Microgaster* sp. (Graf, 1917), *M. phthorimaeae* Mues. (Muesback, 1922), *Zagrammosoma flavolineatum* Cwfd. (Graf, 1917), *Nepeira benevola* var. *fuscifemora* Cush. (Graf, 1917), *Ephialtes aequalis* Prov. (Underhill, 1926), *Hormius pallidipes* Ashm., *Orgillus mellipes* Say, *Meteorus vulgaris* Cress., *Cardiochiles explorator* Say and *Angitia* sp. (Poos and Peters, 1927), *Eulimneria stellenboschensis* Cam. (Edwards, 1929, and Wilkinson, 1929), *Habrocytus cerealellae* Ashm. (Flanders, 1930), *Pimpla (Itoplectis) conquisitor* Say (Underhill, 1926), *Dibrachys clisiocampae* Fitch. (Graf, 1917), *Sympiesis stigmatipennis* Gir. (Poos and Peters, 1927, and Graf, 1917), and *Pediculoides ventricosus* Newp. (Trouvelot, 1924 and Ghesquiere, 1923). Other species recorded as doubtful parasites are *Anaphes* spp. and *Zele melleus* Cress. (Underhill, 1926) and unidentified hymenopterous parasites are also recorded (Jack, 1929, Edwards, 1929, and Spencer and Strong, 1925).

The predators on leaf miner larvæ include the hemiptera *Podisus maculiventris* Say (*spinosus* Dall.) and *Lyctocoris campestris* F., and the ants *Formica fusca subsericea* Say, *Lasius niger americanus* Emery (Underhill, 1926), and *Pheidole pallidula* (Trouvelot, 1924), and two Syrphid flies *Syrphus novae-zealandiae* and *Melanostoma fasciatum* (Miller, 1918).

Only four of the species mentioned appear to be of any real importance in the control of *P. operculella*. The most valuable of these is probably *Microbracon gelechiae* Ashm. (*Habrobracon johanseni* Vier.). This species was introduced from America into France (Trouvelot, 1921), where it has reduced the percentage of infested potatoes (Sagot-Lesage, 1923). "This species develops rapidly (in twelve days during the summer), while the period of oviposition is extensive (thirty days in summer), one female laying an average of 200 eggs; and its destructive action on *P. operculella* is considerable, the larvæ being used by the Braconid both for food and for oviposition purposes." (Trouvelot, 1924.)

In some localities in South Africa as many as 50 per cent. of the larvæ in the leaves of potatoes were found to be parasitised by *Campoplex* (*Omorgus*) *phthorimaeae* Cush. (Schlupp, 1917), while another species of this genus, *C. ferrugineipes,* may be the most important parasite of *P. operculella* in the United States during certain parts of the season (Poos and Peters, 1927, and Underhill, 1926).

The fourth important species, *Eulimneria stellenboschensis* may parasitise as many as 46 per cent. of the larvæ in some localities (Edwards, 1929).

Some of the other species of larval parasites may be of value at times in certain localities.

No parasite of either leaf miner or stem borer has been recorded specifically in Australia, though unidentified parasites and diseases of leaf miner pupæ have been noted in Victoria (French, 1913). An attempt to introduce *Microbracon gelechiae* into Western Australia from California was unsuccessful, as the wasps died in transit (Newman, 1922).

During the course of the present studies some very interesting information respecting the status of natural enemies in North Queensland has been obtained. Natural enemies of both species have been observed, but the status of larval parasites is apparently very different from that obtaining in other countries. In North Queensland, although large numbers of leaf miner moths have been bred from field material, only one larval parasite has yet been discovered. Larvæ of the stem borer appear to be free of all parasites in other countries, yet in North Queensland three species of Braconid wasps have been bred from the larvæ of this pest. The commonest thereof is the species which parasitises the leaf miner. None have as yet been specifically identified, but one or another, if not all three, occur in several widely separated districts, including Bowen, Hervey's Range, Mareeba and Mount Garnet. The predatory mite *Pediculoides ventricosus,* has been found breeding on immature stages of the stem borer, particularly in the Bowen district, but is of negligible importance as a natural control.

Several predators operate on the leaf miner in the Mareeba and surrounding districts. These include Sphecoid wasps, the larva of a Staphlinid beetle, a Pentatomid bug, and the Reduviid *Pristhesancus papuensis* Stål.

ARTIFICIAL CONTROL.

Before considering artificial control measures in detail it is advisable to recapitulate some of the information already recorded.

Flight in both species is more or less restricted to certain times of the day. The first flight occurs soon after sunrise, and continues for nearly two hours, while a second flight begins at dusk and continues for three or four hours. During the intervening hours of daylight the moths are inactive. Adult females sometimes laid fertile eggs before feeding in the laboratory, but usually feeding preceded oviposition. Leaf miner moths are positively phototropic, but stem borer moths are not.

Both species can breed in the stems of mature plants, the leaf miner outside and the stem borer inside the vascular cylinder. As long as the stalk retains its green colour the leaf miner is able to continue breeding, but the stem borer has an even better chance of survival, and live pupæ of this pest have been taken in stems kept in the laboratory for five weeks after the plants had been uprooted in the field. The larvæ of the stem borer, after entering the plant, remain under cover until they emerge as adults. Leaf miner larvæ are inaccessible as long as they occupy mines, but they sometimes leave one leaf and enter another, thrusting aside and rejecting the epidermis when doing so.

The egg stage of both species occupies not longer than four or five days in summer. The eggs of the stem borer are laid on the plant and those of the leaf miner on the soil or plant.

Control of Adults.

The flight habits of the pests led to the investigation of a seed-bed modification aimed at their exclusion from the young plants. A second line of investigation was suggested by the fact that the adults often feed in the laboratory before oviposition begins, and it is therefore likely that they do so in the field also, consequently there was the possibility that gravid moths might be trapped by fluid baits in the field.

Furthermore, although stem borers are not attracted to lights, leaf miner moths are, and the possibility of their control by light trapping during the ovipositional flight was accordingly also thought worthy of investigation.

Seed-bed Modification.

Moths were excluded by careful attention to the borders of seed-beds and the provision of end flaps on the usual storm covers, and it was demonstrated that if the moth-proof covers were not removed between the hours of 5 p.m. and 9 a.m. seed-beds remained free of infestation.

This technique has one serious defect in that it favours the development of blue mould. Thus it is unlikely to be employed extensively during a moist season in which the disease is prevalent.

Fluid Baits.

These have been used with some success for the control of other small moths, but the available literature lacks any discussion of this method for the control of *Phthorimaea* spp. Therefore, when formulating fluid baits for use against leaf miner and stem borer the requirements for various other species were considered. Among these were the oriental peach moth, *Cydia* (*Laspeyresia*) *molesta* Busk. and the codling moth, *Cydia pomonella* L. (Fowler, 1927, Yothers, 1927, &c., and Petersen, 1925, &c.).

Experiments with two series of fluid bait pails were initiated during the autumn of 1933. Series A comprised pails of a molasses and water syrup, and series B pails of honey and water syrups. The molasses was diluted with water to make a 10 per cent. syrup, and either sodium arsenite or sodium benzoate was added to certain of the pails to prevent the development of yeasts and moulds. The honey was diluted with water to two different strengths of syrup, one containing 10 per cent. honey and the other 20 per cent. honey. Preservatives similar to those in series A were used and added to some of the honey pails. Further details of the fluid baits used in each pail will be found in Table 10.

TABLE 10.

FLUID BAITS FOR CONTROL OF THE LEAF MINER AND THE STEM BORER (½-GALLON OF FLUID PER PAIL).

Pails.	Syrup.	Preservative Added.	Total Catch.
A1	10 per cent. molasses in water	..	9
A2	ditto	..	22
A3	ditto	Wire cover with ½-in. mesh	24
A4	ditto	ditto	15
A5	ditto	Sodium arsenite ½ oz. per gall.	20
A6	ditto	ditto ½ oz. per gall.	4
A7	ditto	ditto 1 oz. per gall.	3
A8	ditto	ditto 1 oz. per gall.	19
A9	ditto	Sodium benzoate—½ oz. per gall	31
A10	ditto	ditto ½ oz. per gall.	32
A11	ditto	ditto 1 oz. per gall.	20
A12	ditto	ditto 1 oz. per gall.	16
B1	10 per cent. honey in water	..	41
B2	ditto	Wire cover with ½-in. mesh	15
B3	ditto	Sodium arsenite—½-oz. per gall.	4
B4	ditto	ditto 1 oz. per gall.	0
B5	ditto	Sodium benzoate—½ oz. per gall.	8
B6	ditto	ditto 1 oz. per gall.	25
B7	20 per cent. honey in water	..	6
B8	ditto	Wire cover with ½-in. mesh	10
B9	ditto	Sodium arsenite—½ oz. per gall.	7
B10	ditto	ditto 1 oz. per gall.	8
B11	ditto	Sodium benzoate—½ oz. per gall.	19
B12	ditto	ditto 1 oz. per gall.	20

Containers for the fluid baits consisted of half kerosene tins, and thus had a capacity of 2 gallons and an evaporating surface of approximately 80 square inches. These containers are referred to as bait pails. The pails were coated inside with paraffin wax to prevent corrosion and subsequent interference with the composition of the baits. Each tin was marked to show the space occupied by half a gallon of fluid and thus facilitate the addition of water lost by evaporation. Twenty-four pails were used, there being twelve in each series. In view of the possibility of large moths interfering with the records of such small species as the Phthorimaeas certain of the pails were covered with wire-netting of half-inch mesh to exclude the former.

The trial of these fluid baits was conducted near the Barron River on a farm heavily infested by leaf miner. Two acres of late-planted seedlings had been destroyed by that pest prior to the inception of the experiment, and the field used contained about 4 or 5 acres of maturing tobacco adjacent to these 2 acres. Leaf miner moths were very numerous during the trial and stem borer moths were also present, though not so plentiful as the other species.

The pails were placed 1 chain apart each way, and the catch counted every morning from 1st to 14th May. Observations were then discontinued, as none of the fluids showed any promise of developing sufficient attractiveness to warrant the collection of further data. The weather was fine for the trial, and although several slight falls of rain were recorded the total was less than 1 inch. It was intended to separate all the locally important pests of tobacco when recording the moths collected from the pails, but the results were so disappointing that the details are scarcely worth recording.

During the period of observation the following numbers of moths of the pests indicated comprised the whole catch of economic species:—Corn ear worm, *Heliothis obsoleta* F., 2; green loopers, *Plusia argentifera* Guen. and *P. chalcites* Esper., nil; cluster caterpillar, *Prodenia litura* F., 1; leaf miner, 378; and stem borer, 11. Of the leaf miners 215, or 57 per cent., were taken in the pails containing molasses baits, and 163, or 43 per cent., in the honey baits. The total catch of leaf miners for each day is presented in Table 11, and the total leaf miners trapped in each pail is given in Table 10. The total catch of leaf miners represents an average of little more than one moth daily in each pail, the average in the best individual pail being just under three moths daily. As these pails were in a very heavily infested field where the moths were numerous, satisfactory control by fluid baits seems quite unlikely.

TABLE 11.

FLUID BAITS FOR CONTROL OF THE LEAF MINER AND THE STEM BORER.

Type of Fluid Bait.	DAY OF CATCH (MAY, 1933).														Average per Pail (in 14 Days).
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Water and molasses—10 per cent. (12 pails)	9	5	16	14	14	6	17	34	8	15	11	29	9	28	17·92
Water and honey—10 per cent. (6 pails)..	3	5	10	8	12	2	11	10	10	3	5	6	3	5	15·50
Water and honey—20 per cent. (6 pails)..	4	4	5	2	6	4	6	5	5	8	5	5	4	7	11·66
All pails	16	14	31	24	32	12	34	49	23	26	21	40	16	40	15·75

However, before condemning the fluid baits altogether, two were given an additional trial. These were, respectively, the best baits from each of the two series and pails of both were placed on the ground in a small patch of potatoes. Leaf miner adults were so numerous in this area that hundreds were disturbed on agitating the foliage of a few plants. The pails were left in position for ten days, and the total leaf miner catch in this period was fourteen in one pail and sixteen in the other.

These trials are sufficiently convincing to show that none of the mixtures used can be considered useful for the control of leaf miner or stem borer. Their failure in a densely populated area leaves little room for hope that any of them could prove commercially successful, even with further modification.

Light Traps.

That the leaf miner moth is attracted to lights has been well known for many years. Over forty years ago control recommendations based on the use of light traps were advanced (Kirk, 1894) and since then similar measures have frequently been advocated (Van der Goot, 1924, and others). Unfortunately, none of these authors record the numbers of moths trapped, neither do they publish estimates of the reduction in moth population nor of the expense involved. The collection of data on these and other aspects of the question was therefore considered advisable.

Experiments with light traps were pursued concurrently with the trials outlined in the preceding section, acetylene lamps being used as the source of light. These lamps are inexpensive, easily transported, give a bright light, and the required calcium carbide is easily procured. The particular type of lamp used burned from four to six hours on the one charging, and the flame was about 15 inches above the base. As the evening flight of the moths ceases at about 10 p.m. the lights were burned only from dusk, or 6.30 p.m., for roughly four hours. It was found that the lamps employed in the investigation needed about ½ lb. of calcium carbide per night for the four hours. Thus, four lamps were operated every night for a week at a cost of about 5s. for carbide.

The following four types of traps were tested:—(*a*) A tray of water 3 feet square placed on the ground with the lamp standing in the centre. (*b*) Similar to the former, but, in addition, the water in the tray was covered with a kerosene film. (*c*) Two concentric cylinders of ½-inch mesh wire-netting 3 feet long and 1½ and 2½ feet in diameter, respectively. The cylinders were smeared with tanglefoot and placed on the ground with their axes coincident and vertical. The light was then placed in the centre. (*d*) A single cylinder of cellophane covered wire-netting, the cellophane being smeared with tanglefoot. The cylinder was 3 feet long and 1 foot in diameter, with the light again centrally placed.

Unfortunately the kerosene evaporated from the surface of the water in trap (*b*) soon after the first day, and thus the final results from this trap are comparable with those from trap (*a*).

TABLE 12.

Light Traps for Control of the Leaf Miner.

(Average daily catch per single light).

Light Modification.	Leaf Miner.		Stem Borer.		Both Species.
	♀♀	♂♂	♀♀	♂♂	
a	50	115	3	1	169
b	54	175	3	1	233
c	16	35	..	..	51
d	24	54	..	..	78
Average	36	95	1·5	0·5	133

The lights were all placed in a plot of tobacco which had been planted late and thereafter practically destroyed by the leaf miner. The adults of this pest were numerous and easily disturbed during the day, and stem borer moths were also present. Traps (*a*) and (*b*) were operated over a longer period than were (*c*) and (*d*). The average nightly catch for each type is presented in Table 12, both sexes and species being differentiated. The greatest number of moths caught by any one trap on any one night was 361 at (*b*) on the third night after it was placed out. Of these only 79, or barely 22 per cent., were female leaf miners, 276, or about 76 per cent., being male leaf miners. Only about 2 per cent. were stem borers, but they were all females. A duplicate of trap (*a*) was operated in the small heavily-infested patch of potatoes mentioned in discussing fluid baits. A conservative estimate of the adult population in this area would be many thousands per square chain, yet the average leaf miner catch per night was only 124, nearly 70 per cent. of these being males.

The area on which the four types of trap were compared was bounded on the north by virgin country for several hundred yards. It was decided to use this area to ascertain whether the moths could be attracted to lights over any considerable distance from the infested field. The type (*a*) trap was used and placed on successive nights at distances of 60, 40, and 20 yards, respectively, from the fence of the infested field. No stem borers were taken at any of these points, but the leaf miners recorded were as follows:—At 60 yards 2 females and 1 male, at 40 yards 3 females and 1 male, and at 20 yards 5 females and 1 male.

Several interesting conclusions emerge from these trials. Leaf miner and stem borer moths are not effectively attracted to lights from infested fields over distances greater than a chain. Adult leaf miner moths can be destroyed by light traps, but the small numbers taken in a huge population indicate that light traps cannot be expected to give economic control. In view of the negatively phototropic response shown by the stem borer moths as described in the life history notes, it is not surprising that very few individuals of this species were taken at the lights.

[TO BE CONTINUED.]

MILKING AS AN ART.

Milking might be defined as an art, inasmuch as some persons are more fitted temperamentally for the work. A person who is rough in his manner and irritable in temper can never establish the sympathy between the cow and the milker that is necessary for good results. The milk yield is adversely affected by rough treatment, and the capacity of production over the lactation period is reduced accordingly. Good herdmasters are very careful in the selection of milkers, and will not employ persons who are manifestly bad-tempered or even who profess a dislike for the work. The secretion of milk entails the expenditure of a large amount of nervous energy on the part of the cow. Noise or disturbance, ill handling of cows, roughness in the work, and even spasmodic or intermittent application all tend to check the flow of milk. In the course of a few days decline in production is evident. The system of recording the weight of milk at each milking is an excellent one, and well worth the amount of time the recording occupies. A careful herdmaster will be quick to note any decline in production, and will want to find the reason for it.

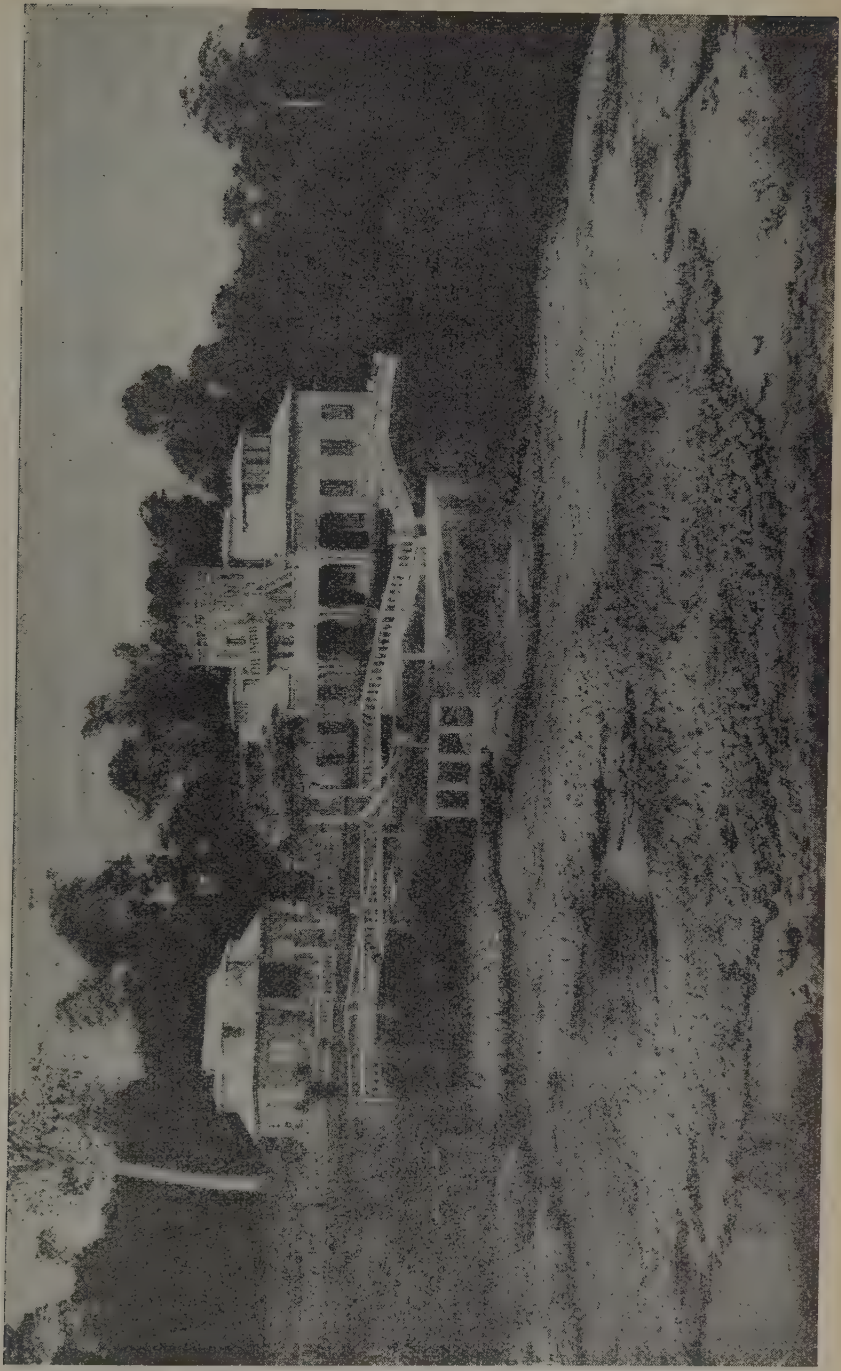

Plate 72.

Paronella Park from top of Mena Creek Falls, Innisfail, North Queensland.

Ergotism in Dairy Cattle.

By J. C. J. MAUNDER, B.V.Sc. (Dairy Branch).

In view of a sickness, somewhat resembling staggers, which may result in dairy cattle after feeding on paspalum the seeds of which are affected by Ergot fungus, the Minister for Agriculture, Mr. Frank W. Bulcock, has made available the following notes, prepared by Mr. Maunder, of the Veterinary Staff of the Dairy Branch.

This disease in paspalum, which is widespread, is recognised easily by the jelly-like substance which adheres to the seed spray and becomes very sticky as it develops.

Dairymen are advised to study these notes carefully and app'y the treatment described as soon as the first symptoms appear in their herd, as the treatment is more effective in the early stages.

THE ingestion of paspalum, affected with the fungus Ergot, is injurious to the health of dairy cattle, and the following brief notes on the condition will enable stockowners to recognise the disease in its early stage, and to adopt effective curative treatment.

The active principles of Ergot act on the nervous system and produce characteristic symptoms and lesions.

It will be noticed that milk production suddenly drops, the affected cow loses condition rapidly, and though it will move about and graze to a certain extent, its movements are those of a sick beast, reluctant to move. There is some disturbance of the digestive system, usually impaction, though sometimes scouring may be present. No marked fever is manifested, temperature, pulse and respiration remaining about normal.

Typical lesions are noted on the muzzle and the teats, where it will be noticed that the skin becomes reddened and sensitive, sore teats and irritation at milking being particularly noticeable. As the condition progresses, the skin of the teats and muzzle may crack and eventually peel off, leaving a raw exposed surface.

A bi-lateral nasal mucous discharge is usually present, and may be combined with excess lachrymation and/or mucous discharge from one or both eyes.

Locomotion may sometimes be disturbed manifested by a staggering gait behind or stiff in front. Muscular twitchings or shivering may sometimes be observed.

Treatment.

Treatment must be applied in early stages if loss of milk production is to be avoided.

The first warning may be simply a drop in milk, sore teats with no other disturbance, or any one of the set of symptoms described.

Drench at once as follows:—Epsom salts 1 lb., ginger 1½ oz. Dissolved in water and given as a drench.

Should response be poor, a tonic mixture or tonic powders could be supplied, but it would appear that these are seldom necessary.

Tonic Powder.—

Ferri Sulph. Exsic.	2 drachms
P. Nux Vom.	1 drachm
Mag. Sulph.	2 oz.
P. Gentian	2 drachms

Give one powder night and morning in treacle. Six powders should suffice.

Vaseline or any ointment should be applied to the sore teats.

Treatment is entirely symptomatic, no specific treatment being known.

Prognosis.

In cases that are treated promptly, return to normal health is rapid and occurs within two to three days. Where treatment has been delayed, or in severe cases, the animal may be sick for two to three weeks, and will not return to full milk supply in the current lactation period.

Though several outbreaks of the disease have been reported from infested paspalum areas, no mortalities have been definitely reported, and it may be assumed that mortality rate is low.

Contrary to popular belief, abortion is an uncommon complication.

Prevention.

Where practicable, mow and burn the affected grass, arrange to graze on fodder crops during the dangerous stage (late summer and early autumn), and adopt any reasonable measures to prevent ingestion of the infected material.

It is realised that in most cases little can be done to prevent ingestion of the infected material, and in prevention the farmer must adopt those measures within his power, dictated by an active and original mind.

FOR HEATING WATER.

Take an empty oil drum and at one end cut a good large hole for a doorway, as shown. Get two ¾-inch pipes, and run through the centre of the drum from end to end, placing them about 6 inches apart. Next cut three square holes in the top of the drum to allow the buckets to come down and rest on the pipes. A good fire can then be placed beneath the buckets of water, which will rapidly come to the boil.

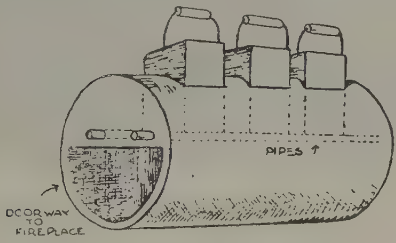

PLATE 73.

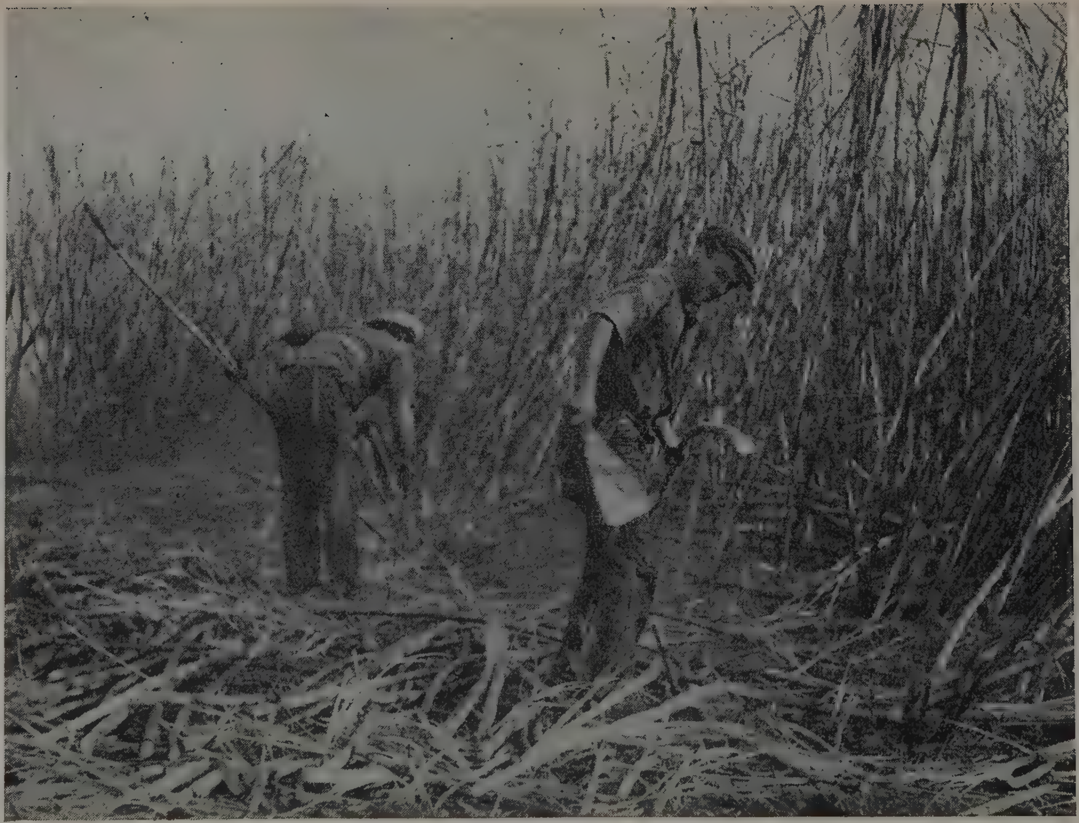

PLATE 74.—CUTTING BURNT CANE.
A North Queensland plantation scene.

[*Photo. by courtesy of ''The Telegraph,'' Brisbane.*

Value of Legumes in Mixed Pastures.

By C. W. WINDERS, B.Sc.Agr., Assistant (Agronomy), Agricultural Branch.

Mixed Pastures Provide Better Feed and More of It.

MOST dairy farmers and stock raisers to-day speak familiarly enough of "balanced rations" and are quite ready to apply the principles of scientific feeding of animals when hand-feeding has to be resorted to in times of pasture scarcity. They understand that the major portion of the ration should consist of carbohydrates (energy-producing and fat-forming materials) and proteins (essential to tissue-building, to wool growth, &c.) in proportions which will vary with the class of stock fed and the purpose of feeding, but when the stock are foraging for a ration on the pasture areas little thought is given at times to the nutrient requirements of the animals. It is true that on many dairy farms the value of grazing lucerne paddocks to provide a protein-rich supplement to the ordinary carbohydrate-rich grass pastures is realised, but in the majority of cases the lucerne areas are utilised for cash-cropping purposes, and their grazing value is a secondary consideration to the farmer.

The factor of high protein content which distinguishes lucerne from the ordinary pasture grasses in the stage at which they are usually grazed is shared by a large number of similar plants belonging to the family of legumes. Included in this family are lucerne, clovers, trefoils, vetches, cowpeas, numerous native plants, &c., and the occurrence of a fair proportion of palatable legumes in a pasture will mean that the pasture is supplying a ration well provided with both proteins and carbohydrates. Further, most of the legumes possess a higher proportion of useful minerals than the grasses, and this enhances the feeding value of the pasture as a whole.

It has been found that the productivity of a grass growing in association with a legume is higher than that of the same grass growing in a pure stand, so that mixed pastures of a grass and a legume, in addition to having a higher feeding value than single-type pastures, may be expected to yield more heavily than pure grass pastures.

What is the Secret?

The explanation of the higher protein content of legumes and of their effect on grasses growing in association with them lies in the little growths or nodules which are found on the roots of leguminous plants. Within these nodules occur bacteria which have the power, not possessed by flowering plants, of collecting nitrogen from the air and transforming it into a nutrient form. Portion of this transformed nitrogen is taken up by the leguminous plant and built up into proteins, and portion is transferred to grasses and other non-legumes growing with the legumes. The effect of this supply of nitrogen fertilizing material on grasses is to keep them in a condition of high production (provided other nutrient materials, such as phosphates and potash, are present in the soil in ample quantities), and so the decline in productivity of a pure grass pasture due to rapid depletion of nutrient nitrogen in the soil may be arrested to some extent by incorporating in the pasture a legume which will build up the supply of nutrient nitrogen in the soil by liberating nitrogen taken from the air and changed into useful nitrogen compounds by the nodule bacteria. Occasionally it is found that lucerne and other legumes when planted on fertile new land in apparently suitable districts do not thrive, and examination shows that the nodules are absent from the roots. In such cases it is necessary to add the requisite bacteria to the seed before sowing, and cultures of these bacteria are prepared for seed inoculation purposes in most States.

Whenever Practicable Include Legumes in Pasture Sowings.

Though the number of species of legumes which will thrive in Queensland under intensive grazing conditions is not great, the range is sufficient to provide a legume for inclusion in most pasture mixtures. Many of our summer pasture grasses make too vigorous a growth during the flush period to allow of the extensive development of legumes in association with them, but if only a small proportion of legumes can be maintained in the pasture that proportion is still worth while. The legumes which are available for sowing in pasture mixtures have been described by the writer in a previous article ("Sown Pastures for Queensland": this Journal, November, 1935), and the chief ones are listed hereunder:—

Summer-growing legumes—Lucerne, Lespedezas, Townsville lucerne.

Winter and Spring-growing legumes—Lucerne, White Clover, Red Clover, Burr Trefoil, English Trefoil, Cluster Clover.

Lucerne is the most generally useful of the pasture legumes. It does particularly well in association with most of the winter pasture grasses, including *Phalaris tuberosa,* Prairie grasses, and Wimmera Rye-grass, and if conditions are suited to it at the time of germination and the pasture is well managed, it will establish and thrive in conjunction with Rhodes grass. Both paspalum and kikuyu grass are apparently too aggressive to permit lucerne to thrive in their pastures.

The Lespedezas or Japanese clovers are established in a few areas of paspalum and native pastures on the lower North Coast, and are worthy of sowing in pasture mixtures on the coast south of Rockhampton and on the Atherton Tableland.

Throughout the wet tropical coast, Townsville lucerne is the most useful legume for inclusion in pastures on scrub soils.

White clover is suitable only for southern coastal conditions and for the Atherton Tableand, where it blends well with paspalum. Red clover also mixes with paspalum, and both red and white clovers are valuable in winter pasture mixtures. The trefoils are best suited to the Darling Downs and to volcanic soils in the Burnett, Lockyer, and Fassifern. Cluster clover is a very hardy species, and a small amount should be included in pasture mixtures in areas with a poor winter rainfall.

PLATE 75.

Tiger Pear (*O. aurantiaca*) at Wheatvale on a Property at present being cleared by the Prickly-pear Land Commission.

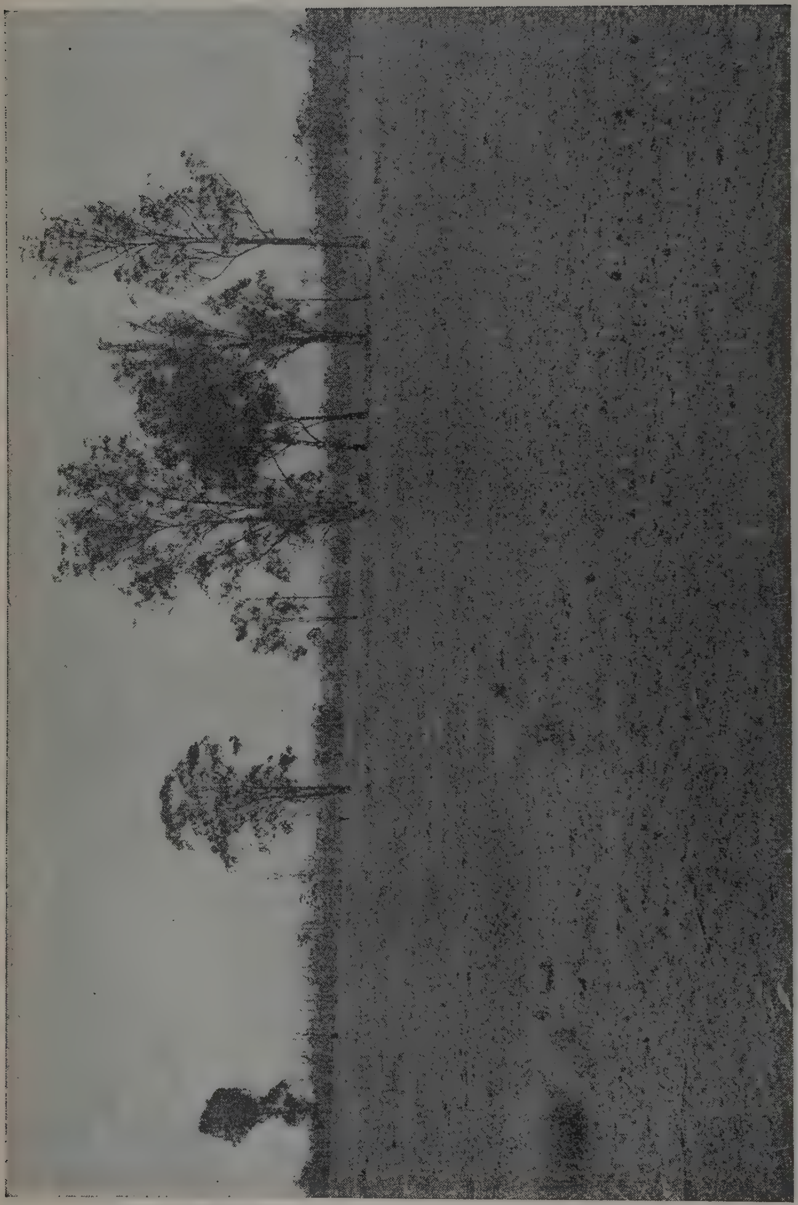

PLATE 76.

Country at Leslie once infested with Tiger Pear and now Cleared.

Plate 77.

Reflections at St. Lucia.

The Lagoon at St. Lucia Farm School for Boys is the irrigation source for a well-worked vegetable garden. It is also a sanctuary for aquatic bird life.

Queensland Weeds.

By C. T. WHITE, Government Botanist.

TRIDAX DAISY OR TRIDAX.

(Tridax procumbens, Family Compositae.)

Description.—A coarse herb spreading several feet and rooting at the nodes. Stems and leaves rough to the touch from being covered with rather scattered hairs. Leaves opposite, mostly about 1½ inches long and about half as wide in the broadest part, dark green above, paler beneath, edges deeply cut or toothed. Flowering stems terminal arising from forks in the branches, at first short but lengthening out later, when in full flower or seed from 9 inches to a foot in length. "Flower" or re-flower head ½ inch across, composed of a single series (about 7) of ray-florets, outside pale lemon-yellow cut into three teeth at the top and numerous darker yellow disc florets in the centre, the whole surrounded on the outside by several green, hairy, involucral bracts, simulating a calyx. "Seeds," achenes one line long, covered with long, white, silky hairs and surmounted by a ring of plumose hairs (the pappus) about twice as long as the seed itself.

Distribution.—A native of Tropical America now naturalised in many warm countries. It was first noticed in Queensland near Townsville, but is now widely spread along the coast as far south as Brisbane.

Botanical Name.—Tridax, from the Greek, meaning cut into three, in allusion to the ends of the ray-florets; procumbens, Latin, meaning leaning forward, referring to the procumbent stems.

Common Name.—Though an abundant weed, I have not heard a common name given to it. The generic one Tridax is short enough for general usage.

Properties.—The plant is not known to possess any harmful properties. One grazier informed me that horses were very fond of it, and eat it ravenously. Personally, I have not noticed stock eat it to any extent, though in some areas I have seen cattle eating it on a face along with other grasses and herbage.

Eradication.—The weed does not seem to call for any special method of treatment. Where difficult to eradicate the ordinary methods of chipping and cultivating. It would probably quickly succumb to weak arsenical and other weed sprays.

Botanical Reference.—*Tridax procumbens,* Linnaeus, Species Plantarum, 900.

◆

WHAT THE YELLOW WRAPPER MEANS.

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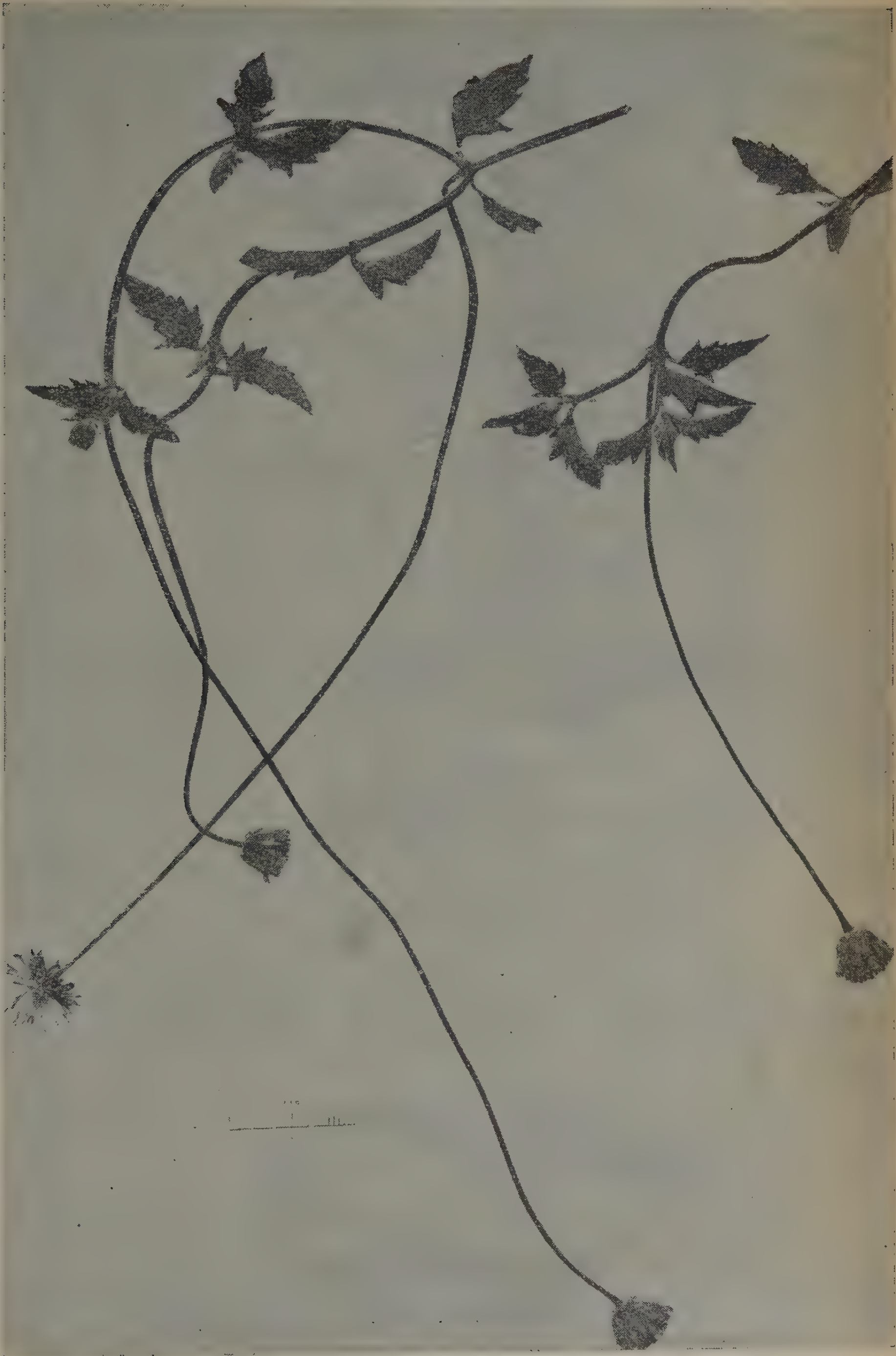
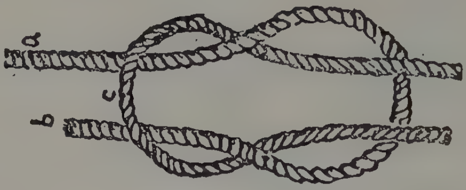


PLATE 78.
Tridax or Tridax Daisy (*Tridax procumbens*).

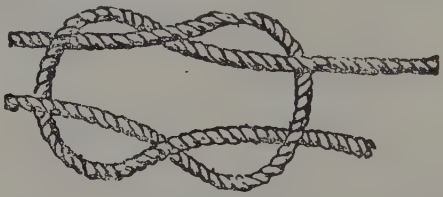
KNOTS AND HITCHES.

In handling stock and farm produce the necessity for a knowledge of suitable knots or hitches often arises.



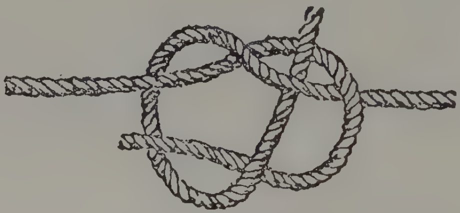
Square Knot.

One of the most common, and probably one that is used most often, is the square knot. It is easy to tie, and yet a great many people have difficulty with it. To tie it take your rope or cord and tie an ordinary right-hand overhand knot, and follow this with the left-hand form of the same knot.



Granny Knot.

The square knot is a good one to use when tying two ropes together, but do not get it mixed with the granny knot. This is the ordinary hard knot. It slips easily unless very tightly tied, and then it is hard to untie.



Weaver's Knot.

The weaver's knot is another one you can use for tying two ropes or straps together. It is easily untied, and never draws tight. If you are driving a four-horse team it comes in handy when you have to tie the lines together. Study illustration, and with a little practice you will find it easy.

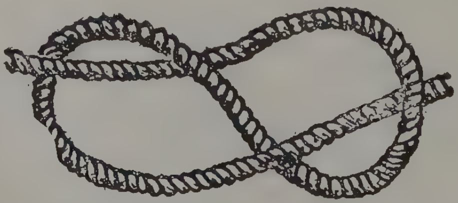
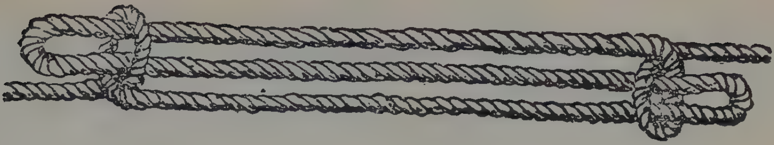


Figure Eight Knot.

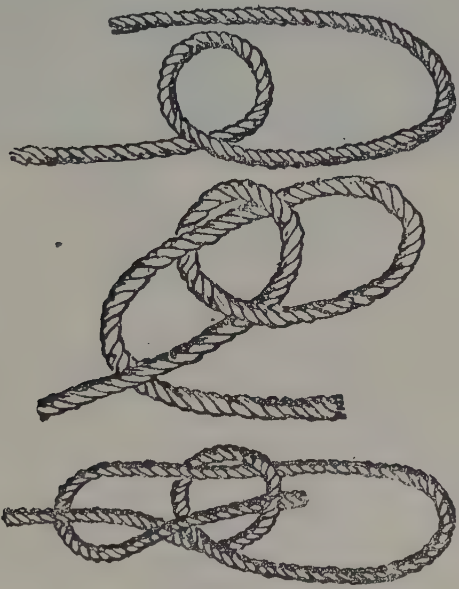
The figure eight knot is often used at the end of a rope to keep the strands from untwisting or to prevent the rope from slipping through a hole or pulley.

PLATE 79.



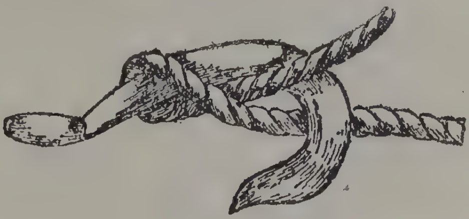
Sheepshank Knot.

Did you ever want to haul something with a rope, and, after the team was hitched on, find the rope too long? The sheepshank will help you out of just such a difficulty. It can be tied in a minute, unties easily, and will hold as long as the rope is tight. To keep is from untying when the rope is loosened fasten the loops to the main part of the rope.



Bowline Knot.

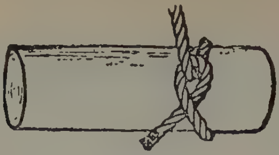
Probably one of the most useful knots of all is the bowline. You often want a loop that will not slip or pull, and the bowline knot is the easiest way to tie it. If you have not a neck-strap or halter for the horse a rope will do for the time being if you can tie a bowline. Illustration shows you how.



Blackwall Hitch.

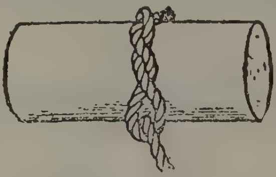
The blackwall hitch is the simplest of all hitches to make. It does not look very safe, but it really is so long as there is a steady pull on the rope. A big advantage is that a shake of the rope loosens it. It sometimes comes in handy when descending from a tree or other high place.

PLATE 80.

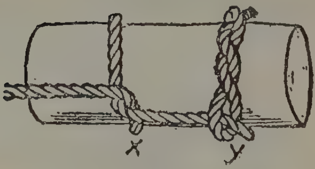


Half-hitch.

The half-hitch is another good temporary fastening. So long as there is a fairly steady pull it will hold, and like the blackwall hitch, it is easily loosened. It is simply a loop around the standing part with the short end of the rope pinched beneath the loop.

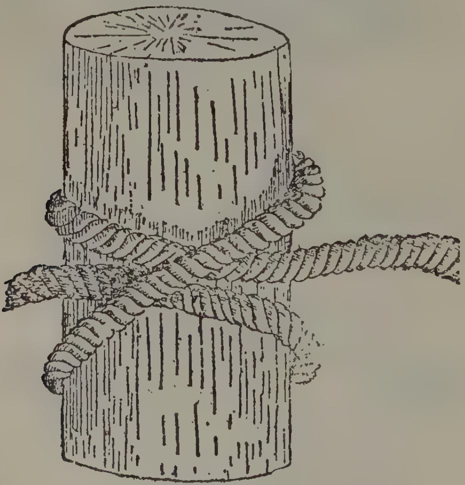


Timber Hitch.



Half and Timber Hitches.

The timber hitch is more secure, and, as the name suggests, it is often used in hauling logs or timbers. It is really very much like the half-hitch, except that the short end is wrapped around part of the loop one or more times instead of simply being pinched under it. The combination of these two hitches is much more secure than either one alone, and sometimes you will have use for it. It comes in handy if you have to lift long timbers or pipes out of a well, for instance, where there is a straight pull. Illustration shows the combination.



Clove Hitch.

The clove hitch is a much-used temporary fastening for boats, or even for hauling timbers, although it is less secure than the combination just mentioned. It can be made by having two half-hitches opposite each other and dropping the loops thus formed over the end of the timber or post.

PLATE 81.

The COTTON INDUSTRY

CONSIGNMENT OF COTTON.

By W. G. WELLS, Director of Cotton Culture.

THE cotton areas of Queensland are mostly situated at some considerable distance from the ginneries, which are placed at the coastal centres of Rockhampton, Gladstone, and Brisbane, in order to be centrally located for the different railways, and also for the shipping facilities. It is necessary, therefore, for the grower to forward his cotton in containers, and the once used wool pack has been found to be very suitable for this purpose. By extending the pack to its full length and pressing the cotton in tightly, as much as 600 lb. of seed cotton can be put into it, although the usual content is generally around 500 lb., which is the desirable maximum amount.

Many growers pack more than 500 lb. into a bale, however, as they pay by the bale for the cartage from the farm to the railway. A grower with a large acreage producing a heavy yield can thus reduce transportation expenses considerably by sending heavy bales. It is inadvisable to do this, however, for heavy packing of a bale necessitates tramping the cotton in so tightly that it is difficult to clean it thoroughly. If the cotton has been picked when it is "green"—that is, before the fibres and seed have thoroughly dried out after the boll opens—there is grave danger of the contents of a tightly-packed bale heating or going through a "sweat," as it is described. This tends to make the fibres stick tightly to any foreign matter amongst them, and thus makes it difficult or almost impossible to remove much of the small leaf and pieces of the burr of the boll during the cleaning operations prior to ginning the cotton. The lint obtained may thus be of considerably lower value than would have been the case had the seed cotton reached the ginnery in a condition that would have allowed of a better removal of the foreign matter in it.

It can be realised, therefore, that cotton should not be picked after a storm, until the wind and sun have dried and fluffed out the locks. Likewise, cotton should not be "snapped" until the burrs are dead, for if packed with green burrs the fibres absorb the moisture from them and "heat" so badly that the cleaning machinery can remove only a small proportion of the trash and material amongst them. The snapped cotton should also not be packed too tightly in the bale, for where this is done the fibres are pressed and twisted around the broken pieces of burrs and bracts to such an extent that much of the trash cannot be separated from the fibres even with the extra cleaning the snapped cotton is given.

It would be far better if all growers forwarded only bales weighing from 480 to 500 lb. Bales of these weights are easily handled in the operations at the ginnery, the contents, if of dry cotton, are cleaned better, and with fairly uniform weights of such nature, the ginning of the different grades and staple lengths can be done, in terms of bales of lint of 500 lb. weight, to better advantage.

PLATE 82.

UNLOADING WOOL PACKS OF SEED COTTON ON ARRIVAL AT THE GINNERY.

During the peak period of arrivals as much as 120,000 lb. of seed cotton is received in a day. Growers should therefore forward cotton in wool packs only in order to assist, as much as possible, the grading and receiving of the crop.

Grade the Cotton When Baling.

The usual method of baling cotton is to attach the corners of the bale to heavy wires suspended from a square frame supported by posts upright in the ground. These baling points are generally built in different parts of the field in the case of large areas, or some central point in small fields, to facilitate the weighing and packing. As the pickers weigh their pickings for the day, the contents of the bags are emptied into a suspended bale and packed by means of tramping the cotton down tightly. This system tends to produce layers of cotton of different grades in the one wool pack, depending on the variation in the cleanliness of picking of the individual pickers. It is believed that better returns would be realised by the grower and more uniform content of the ginned bale of lint would be obtained, if growers with sufficient acreage to produce several bales at a picking would roughly grade the cotton of each picker's sack into, say, one of three grades—clean, clean spotted, and dirty, dirty spotted or dull off-colour cotton. With a wool pack for each of these grades the pickings of a crew of pickers could be easily segregated, and a much more uniform content of each bale forwarded to the ginnery would be obtained. In the case of small acreages where only a few pickers are operating, it may not be possible to obtain enough cotton of each of the three grades to fill a bale of each. In such circumstances a careful blending of the cotton before baling greatly improves the uniformity. This is a very important point to which all growers should pay more attention, for such a practice would assist the grading operations and permit the obtaining of bales of lint with a high uniformity of content.

Pack Only Clean Containers.

Careful inspection of the container should be made before filling it with cotton. Some growers with small acreages use once used chaff bags, and unless these are carefully cleaned the cotton will contain bits of the chaff when the bags are opened at the ginnery. Picking sacks should also be cleaned before they are used. It is also advisable to shake the wool packs before filling them, in order to remove dust and trash that may collect on them during the transport to the field.

Another very important feature to observe is the removal of all seed cotton sticking to the bale before filling it. Cotton sticks easily to any rough surface, and a careful inspection should be made of each bale by turning it inside out and removing all cotton in the seams, &c., otherwise serious contamination of stocks of pedigreed seed may result.

Brand the Container.

Each grower should make a stencil for branding every container of cotton forwarded to the ginnery. This stencil should contain his initials and name, registration number, and railway address. The container should be clearly branded with this stencil on a smooth, clean face, using a lasting marking fluid so that the identity can be easily and quickly determined. Each season difficulty is experienced at the ginneries through growers failing to observe these details, and it is in their own interests that this position should be corrected.

Labelling Containers.

It is necessary to know the variety of seed cotton in each container that arrives at the ginnery in order to determine the estimated percentage of lint contained therein. This data is required, because the grower is paid on the basis of the amount of lint he forwards, and the grade and staple length thereof. Where a grower has only the one variety, no tagging is required, as this fact is recorded at the ginnery; but where it is necessary to have more than one variety, tags for each one are sent. When more than one variety is grown on a farm, every care should be taken to prevent mixture or loss of identity of the varieties, and each container should be carefully labelled under the brand, with the proper tag for the variety contained in it. The tag should be sewn on in the usual cross-diamond method, so as to protect it to the fullest extent from being torn off during the handling of the container.

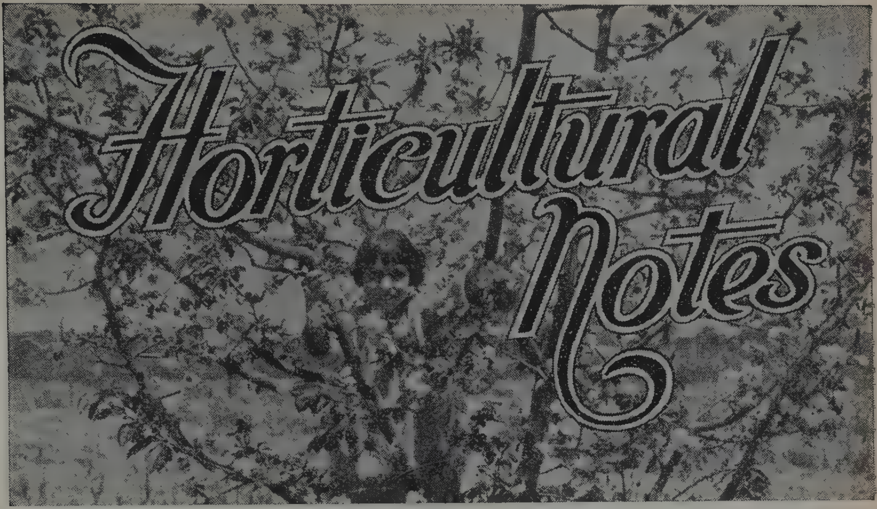
Use Wool Packs.

It is especially urged that wool packs be used wherever the size of the crop will permit it. A considerable number of growers still forward their cotton in chaff bags, even from crops of 5 to 10 acres in extent. The use of chaff bags slows up the grading and weighing operations, for each container has to be graded and weighed separately, thus increasing the work of these operations five to six fold. The chaff bags are also more expensive to use, for the number required to forward 500 lb. of cotton will cost about as much as a once used wool pack purchased through the Cotton Board, while owing to their being so tightly packed, it is necessary to cut them open to empty the cotton, making them useless for forwarding cotton again. The wool pack, however, is cut down the seams, and thus can be sewed up and used repeatedly. The packs of each grower are sent back to him, after they have been heated at a high temperature to kill any pests in them, for a charge of 6d. per bale, which also covers the freight on it.

Conclusion.

It is strongly recommended that growers pay careful attention to the points that have just been touched upon. With a general observance of them, a greater efficiency and reduction in expenses can be obtained in the operations at the ginneries and on the farm, with a consequent increase in returns to the grower.

Plate 83.
A pretty reach of the Russell River.



GRAPEGROWING IN THE STANTHORPE DISTRICT.

By F. L. JARDINE, Inspector of Plants, Stanthorpe.

ALTHOUGH the grape vine has been in cultivation in the Stanthorpe district for over half a century, it is only during comparatively recent years that this branch of industry has come into prominence. To such an extent, indeed, is this so, that it shows promise of being, in future, the premier grape-producing region of this State.

Plate 84.
Portion of a typical Stanthorpe vineyard in winter garb.

History of the Industry.

As far back as 1873, when the settlers were engaged actively in the search for tin, the subject of fruit production had not claimed serious attention. Father Davidi, parish priest at that time, was a native of Italy, and was well versed in horticulture and viticulture. He saw the natural advantages that the district offered for the cultivation of deciduous trees and grape vines. He saw far beyond the tin fields, and actually prophesied that one day the Stanthorpe district would be covered with orchards and vineyards like his native province in Italy. He even urged his congregation from the pulpit to engage in the cultivation of fruit trees and vines. To prove his faith in his own words, he planted a small area himself; and to this day there remain in bearing some of the original trees and vines. Bearing in mind Father Davidi's prophecy, it affords a great feeling of satisfaction, to those acquainted with the district, to review the progress that has been made during the

PLATE 85.
A four-year-old Gros Colman vine.

PLATE 86.
An early Bordeaux spray on young growth to check fungus diseases.

past fifty years. The growers themselves, who followed that advice, have proved the soundness of Father Davidi's judgment, and have profited by their foresight, and the methods which they adopted in establishing and developing the viticultural industry in the Granite Belt.

Climatic Advantages.

Both climate and soil are both naturally conducive to long life and the ripening of fruit. The district is endowed with other natural advantages so necessary for the successful cultivation of the grape vine, situated as it is over 3,000 feet above sea-level, with only a limited but well distributed rainfall of between 20 and 30 inches. The cold winters afford the vines a full measure of rest during their dormant period; while the dry, clear atmosphere during the summer months checks considerably the fungus diseases peculiar to the vine in coastal and more humid regions.

Plate 87.

Disc cultivator and tractor working in a Stanthorpe vineyard.

During summer the vineyards are naturally at their best. The lines of green foliage sheltering a wide range of some of the choicest varieties of grapes.

Progress of the Industry.

Although progress has not been rapid, it has been developed along sound lines. The vineyards generally present an orderly and well-kept appearance, being established on the same system—namely, the trellis with 10-feet avenues, the distance between the vines averaging 6 feet.

Thirty years ago the area under vines would probably not exceed a hundred acres; while to-day the young vines and the vineyards in bearing would probably aggregate perhaps three thousand acres.

There is an increasing tendency towards the mechanisation of the industry. On the larger areas, the horse is being replaced by the tractor for purposes of cultivation; while power pumps have displaced the old-fashioned methods of spraying by hand.

Control of Disease.

Every precaution is being taken in the control of vine diseases. Growers realise fully that the devastating effects of the fungus enemies of the vines are not to be underrated. This is demonstrated by the systematic spraying and dusting campaigns carried out each year.

Varieties and Export.

Already trial shipments have been forwarded to Vancouver and to Covent Garden, as well as a trial shipment to the East. The results were encouraging, and provision is being made to send further consignments on a larger scale this year. It is hoped that in a few years the industry will have developed into a valuable addition to Queensland's export trade. Among the varieties cultivated are included Muscat, Hamburg, Waltham Cross, Purple Cornichon, Red and Black Malaga, Servant, Red Hanneport, Flame of Tokay, Gross Coleman, Belas Blanco, Red and White Ladies' Fingers, White Syrian, Grand Centennial, Chaoch, and Cinsaut.

SOME TROPICAL FRUITS.

No. 7.—THE FIVE CORNER.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

A TROPICAL fruit of Asiatic origin, the Five Corner, is now distributed widely throughout the warmer regions of the world. Its susceptibility to damage by frost limits its growth to the tropics, but in these regions of Asia, Australia, America, and the Pacific Islands it is now frequently met with. Its introduction into Queensland dates from about the end of the nineteenth century.

The tree is not very large, growing to an ultimate height of about 30 feet. The compound leaves, composed of two to five pairs of light-green leaflets 1½ inches to 3 inches in length, together with the clusters of small purplish flowers, and the yellow fruit give the tree a handsome appearance.

The flowers are borne in short racemes arising from both the young and old wood. The flowering period extends over about nine months of the year, and the cropping extends over a like period, ripe and green fruit being present on the tree together at any time except at the very end of the fruiting season.

The shape of the fruit is responsible for the common name which it bears. Three to five inches in length, oval or elliptic in outline, the fruit is ribbed longitudinally with three, four, or five (usually five) prominent and sharply angled ribs. When cut transversely the cross section is star-shaped. The fruit is glossy, translucent, and light-green when young, and changes to yellow or yellow-brown when ripe. The skin is very thin and covers a clear juicy flesh, rather astringent when green, but pleasantly acid and refreshing when ripe, and possessing a strong perfume.

Although no horticultural varieties are established sweet and sour types are recognised, and both are to be found in North Queensland. The sweet type is usually eaten fresh, but the sour type is too acid to be pleasant in the fresh state, and is more suitable for jelly or pickles. The fruit of the sour type is usually larger than that of the sweet type.

The common name of the Five Corner in most other countries is Carambola, following the specific botanical name. In various parts of the Philippines it is also called Daligan, Balimbin, Garangan, and Malinbin. The Indian name is Kamranga, and in China it is Yung tau. The botanical name is *Averrhoa carambola,* L.

The preference of the tree is for a rich deep soil, but it will grow on sandy soil, or even on a very heavy one. A moist climate is preferable, but is not an actual necessity, as is proved by its establishment in the dry climate of Northern India. Tropical temperatures are strictly necessary, however. When young the tree is rather delicate, but given a warm, moist climate with a suitable soil, it quickly establishes itself and makes rapid growth.

Propagation is usually by seed, and is easily effected. Only a small percentage of seed appear to be fertile, however, and care is necessary to select well developed seed for planting.

P. J. Wester, of the Philippines Department of Agriculture, has found that vegetative propagation may be carried out by shield budding. He recommends the selection of petioled budwood, ripe, smooth, and purple in colour. The buds should be cut 1 inch to 1½ inches long.

The young trees may be set in the field during the periods between September and November or February and April, and should be planted 20 feet apart.

FRUIT PACKING INSTRUCTION.

By **JAMES H. GREGORY,** Instructor in Fruit Packing.

IN these days of marketing difficulties, no fruitgrower need handicap himself by not adopting modern methods of marketing, for practical packing instruction is available to all. The policy of conducting packing classes of young people, adopted by the Fruit Branch of the Queensland Department of Agriculture and Stock, is now showing results. Close observers in the markets are unanimous in expressing the opinion that over the last few years the pack and general get-up of fruit has greatly improved. While this is true, there is still room for improvement. To-day, all successful growers have adopted the most up-to-date methods of marketing. Unfortunately, the smaller grower is often not showing the same advance in methods, and this fact at present constitutes something of a problem. Apparently unwilling to avail himself of the services of the Department, he is mainly responsible for the placing of poor-quality fruit on the market. The marketing of poor-quality fruit is, as has been pointed out on various occasions in departmental marketing notes, a great influence on reducing the market values to a lower level. We are loth to believe that these growers are deliberately avoiding their obligations to the fruit industry as a whole, and we assume that it is possibly ignorance of the services available that prevents their attempting to make an improvement.

In conjunction with the Department of Public Instruction, packing classes are held at many schools. At these classes pupils of twelve years of age and over attending the local school are taken into the class for training. It is felt that, generally speaking, pupils under this age are too young. Classes are then formed of, if possible, not more than eight (8) pupils. More than eight in a class makes the class harder to manage by one teacher, with a consequent drop in efficiency. The class is then given instruction as regularly as possible—once a week if the means are available. Each lesson is of one hour's duration. At the

PLATE 88.
Tomato Packing Class at work at Russell Island on the farm of Mr. K. Holland.

PLATE 89.
A Russell Island Fruit Packing Class. Some of the finished cases.

first class which is held at the school, the theoretical side of packing is given, essential notes are taken, and the pupils are generally prepared for the practical work. For the pupils to obtain the necessary practice in this, a grower's farm within reasonable distance of the school is then found. Many growers have shown a fine spirit of co-operation in assisting the Department by making available their farms, and providing the necessary fruit and materials, without in many cases having the incentive of having a member of their family as a pupil in the class. Of course, they get a return of having many cases of fruit packed up for them ready for market. The classes for any particular kind of fruit end with the season. Generally, up to six lessons of one hour each are given to the classes. It has been said that the pupils are not expert packers when a season of classes ends. Reasonable packers of experience realise that they cannot expect the children to be expert packers after only six hours of broken tuition, but with children of average intelligence excellent results have been obtained in laying the foundation for good packers. After two seasons of tuition covering, say, ten to twelve lessons, many pupils are quite expert.

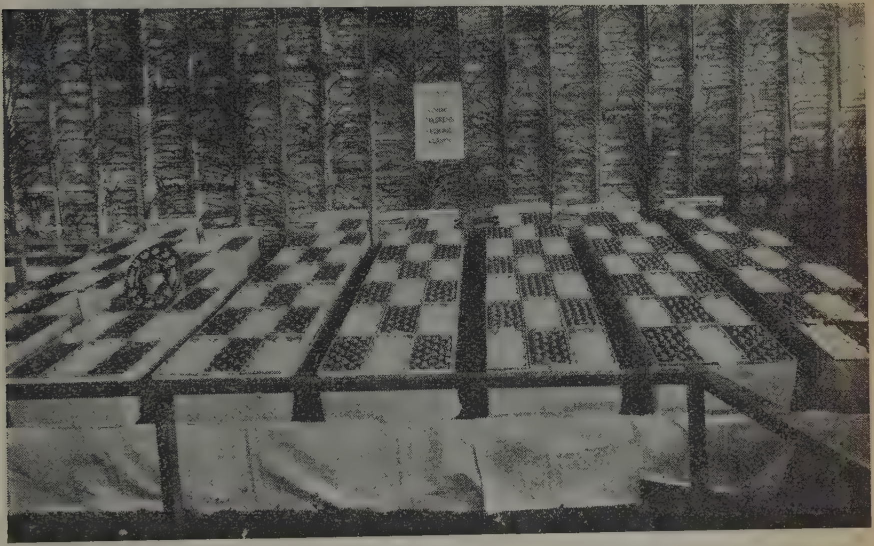


Plate 90.

Competitive display of packed citrus fruits, Brisbane Royal National Exhibition, exhibited by citrus packing classes in competition for the John Macdonald Shield.

At the present time, classes are held in the citrus areas of the North and South Coasts, and Howard and Gayndah districts. Tamborine Mountain, Elimbah, Mapleton, Flaxton, Montville, Palmwoods, Woombye, Chevallum, Nambour Rural, Yandina, Buderim, Howard, and Gayndah schools have annual classes. At the Royal National Exhibition each year a packing competition is held amongst the above schools for a shield to be held for twelve months by the winning school. The entry, which comprises ten cases packed by a team of five pupils, is a keenly contested one. By winning this year the Mapleton school retained the John Macdonald Shield for all time. This shield was competed for over a period of eleven years, the school winning the shield the most number of times to retain it for ever. To replace the John

Macdonald Shield another has been donated by Mr. H. Walker, M.L.A., for future competition. The William Rowlands Shield is also competed for by North Coast schools at the Maroochy Agricultural Society's annual show. The competition for this shield was instituted in memory of Mr. William Rowlands, who was the first Government Packing Instructor in Queensland. Examples of the excellence of his work are still to be seen throughout the State, many growers having become good packers through his efforts. In addition to the classes for the younger generation, visits are paid to orchards and plantations for the purpose of first-hand instructions to growers. Observations and checks are made of consignments on the markets and in cold storage for growers anxious to know how their consignments when packed keep in transit and cold storage. Experiments in storage, various types of packing, improved boxes, and packing materials are constantly being made. Packing charts and pamphlets on packing, storage, and marketing of all fruits are published or in course of publication, and may be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane. Applications for service should also be sent to the same address. For this short résumé of the operations of the marketing section of the Department's Fruit Branch, it can be seen that there is no need for growers to remain in ignorance of the latest marketing and storage methods.

PLATE 91.—MAPLETON STATE SCHOOL FRUIT PACKING CLASS.

This class is the outright winner of the John Macdonald Shield, and are also the present holders of the William Rowlands Shield competed for at the Annual Show held by the Maroochy Agricultural and Horticultural Society at Nambour each year.

FRUIT MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

THE outstanding feature of the month's marketing operations has been the phenomenal drop in the price of Granny Smith apples. First consignments realised up to 12s. per case, but within a week prices were touching as low as 6s. per case. One can only blame immaturity, the fruit being too green to be satisfactory, even as a cooker. The question is being raised, "Are we planting too many Granny Smith apples?" Rather, I would ask, "Are we spoiling the pride of Queensland apples by bad marketing methods?" It was pleasing to note that the price of Dunns was maintained better this season. Again, we might well ask whether Dunns are not being sacrificed by trying to market Granny Smiths too early. Local consignments of stone fruits are now decreasing on the market. The season on the whole has been a good one. Pineapples have maintained steady rates, but the prices of bananas have, unfortunately, been very unsatisfactory.

Apples.—Granny Smiths, at the start of the season 12s., are now 5s. to 7s. It is expected that better prices will be realised from the beginning of March. Dunns, 4s. to 5s.; Jonathan, 5s. to 7s.; Delicious, 4s. to 8s. Many growers are losing money through picking the whole of the crop instead of rotational picking, first harvesting the large fruit and permitting the smaller ones to grow before picking. If an apple grows a quarter of an inch more in size it becomes a third as large again. A study of packing counts proves this.

Stone Fruits.—All stone fruits have been good value, but have now eased in price and become slower of sale.

Plums.—Ponds, 6s. to 8s.; Grand Duke, 5s. to 6s.; President, 6s. to 7s. Fine quality Japs have realised up to 11s., but are now off the market.

Peaches.—2s. 6d. to 4s. 6d. a half-bushel.

Pears.—William Bon Cretian, 6s. to 9s.; others, 4s. to 7s. Growers are reminded of the absolute necessity for wrapping all lines of pears.

Grapes.—Muscatels, 4s. to 5s. 6d.; Colemans, 3s. 6d. to 4s. 6d.; Ascots, 3s. to 4s.; Black Prince, 4s. to 4s. 6d.; Walthams, 6s. to 8s. Many lines have been condemned for not conforming to the new Maturity Standard, which states that "Matured Fruit" means, in relation to fresh grapes intended for table use, grapes of which the specific gravity of the filtered juice is not less than 1·066, or 9 degrees Baume at 60 degrees Fahrenheit. Remember that the public wants sweet grapes only, and sending in poor-quality fruit only reduces the prices.

Papaws.—3s. to 7s. a bushel case were received, and the quality generally has not been the best.

Pines.—Prices have been maintained of late with the assistance of the factory clearances. Smooths, 4s. to 6s. a case; Roughs, 1s. to 5s. per dozen; Smooths (Melbourne), 7s. to 9s.; Smooths (Sydney), 7s. to 9s. A few blister-affected lines were received.

Citrus.—Supplies of oranges are being obtained from Southern States, and consist mainly of poor quality, poorly-coloured Valencias, selling at 6s. to 10s. Queensland lemons are in good demand, and are showing some very fine quality, "Benyenda" reaching 20s. to 23s., "Gayndah" 15s. to 20s., and other lines 14s. to 16s.

Bananas.—Heavy supplies are still coming to hand, and prices are low—4s. to 10s. in Brisbane. There has been a tendency on the part of some agents to return a flat rate for the whole consignment of all sizes. This is hard to understand, since there is a definite difference in values in the different sizes.

The prices on the Melbourne market, which are not the best, are as follows:—Nines and Eights, 10s. to 11s.; Sevens, 9s. to 10s.; Sixes, 8s. to 9s. Sydney prices—Nines and Eights, 10s. to 12s.; Sevens, 9s. to 10s.; Sixes, 8s. to 9s. The quality of the fruit coming to hand is better, although the influence of the season's frosts still appears to be manifest in some consignments.

Passion Fruit.—These have proved valuable, up to 25s. per case being obtained. Values have now eased, but are still profitable—Brisbane, 5s. to 10s.; Sydney, 7s. to 9s.; Melbourne, 7s. to 11s. The highest price is for extra special lines only.

Tomatoes.—Ripe, 2s. to 6s.; green, 2s. 6d. to 4s. 6d. Supplies have been lighter, so values have maintained. Too many immature lines are to be found. These do not colour satisfactorily, and help spoil the market.

Mangoes.—Mangoes have not been up to their usual standard this season, owing to the prolonged dry spell in the North; 4s. to 8s. has been the ruling price, with a few specials higher.

General.—Cucumbers have been over-supplied of late. Good vegetables have maintained even prices. Lettuce received 6d. to 2s. per dozen. Many lines are spoiled through bad handling. Packing in cases would be a great improvement, the tropical fruit case being ideal for the purpose.

Export.—Growers are requested to make themselves familiar with the changes in the export regulations for apples. Care must also be taken to procure correctly-cut case timber.

Apple-packing charts are available free to all growers.

WINES FROM TROPICAL FRUITS.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

AT times every orchardist has a quantity of fruit which, owing to some slight superficial blemish, or perhaps because it is too ripe to pack, is unfit for market. Such fruit is usually discarded and goes to waste. Some, at least, of this could be turned into a profitable commodity by converting it to wine.

The process is a simple one, but to be assured of success the producer must not be impatient to achieve monetary results. The secret lies in proper fermentation and lengthy maturing. Although some of the recipes given below stipulate a few weeks or months in the wood, an improvement in quality would be obtained by allowing twelve months for maturing before bottling off.

The process is essentially the same with all fruits. Variations in the processes with any one kind of fruit are largely a matter of individual fancy, as, for example, the adding of brandy or rum after fermentation. Whilst it is my opinion that this definitely improves the wine, some may hold a contrary opinion and prefer to omit it. Indeed, many of the recipes do omit it.

Before proceeding to detail a few recipes the following general remarks, which apply to all wine making, may be made.

Firstly, only wood or earthenware vessels should be used. Wood is preferable. Under no circumstances should a vessel of iron or any other metal be used.

Secondly, the vessels used must be perfectly clean.

Thirdly, during fermentation the cask must be filled daily almost to the bung hole from a small quantity retained for this purpose. If this should be all exhausted before fermentation is complete clean cold water must be used. Fermentation usually takes about three weeks.

Fourthly, throughout the whole process and while the wine is maturing in the wood the temperature should be as even as possible, and around 60 deg. Fahr.

The following recipes have been collected from various sources. Several are personally known to the writer to produce good wine, whilst all are reputed to be good. Quantities may be increased or reduced in proportion, according as it is desired to make a greater or less quantity.

Orange Wine No. 1.

Squeeze sufficient oranges to make 2½ gallons of juice. Add 25 lb. of sugar. Put the orange pulp into a separate tub and cover with cold water, allowing it to stand for twenty-four hours. Then strain and add the liqud to the juice and sugar. Add more water, if necessary, to make the quantity up to 10 gallons of liquor, and let stand for twenty-four hours. Then strain off and fill cask. Keep cask filled with additional liquor or cold water, and when fermentation is complete bung up and set aside for twelve months.

Orange Wine No. 2.

Put 40 lb. of sound, peeled oranges into a well-cleaned wooden tub or vat. Bruise the fruit and pour over it 4 gallons of water. Stir the whole thoroughly and work the fruit with the hands until the juice and pulp is separated from the pith and rag. Then allow it to stand for twenty-four hours. Strain through a coarse cloth with gentle pressure. Wash the mash with a gallon of clean water to remove any remaining soluble matter and strain it through into the other juice. Dissolve 25 lb. to 30 lb. of sugar in the liquor and then add sufficient water to make up to 10½ gallons. Cover the vat with a blanket and board, and allow to stand twelve to twenty-four hours, according to the state of the fermentative process. Draw off into a cask, filling almost to the bung hole, so that the scum may overflow as fermentation goes on. Add a little liquor daily to keep the level just below the bung hole. When fermentation is almost complete knock the bung in tightly and bore a small gimlet hole in the side, pegging it lightly. Remove the peg from time to time to allow the gas to escape. When the gas escape is so feeble that it will not extinguish a lighted match the peg may be knocked home. Then add a tablespoon of isinglass to fine the wine, and in a few weeks it will be fit for bottling.

Orange Wine No. 3.

Dissolve 15 lb. of loaf sugar in 4 gallons of water over gentle heat. Add the whites and broken shells of three eggs. Bring to the boil and then reduce the heat so that the syrup only simmers. Remove from the fire after twenty minutes, and when nearly cold strain into a large tub. Squeeze and strain the juice of fifty large seville oranges. Stir it into the syrup and add three tablespoons of brewer's yeast. Cover with a cloth and leave for at least twenty-four hours. Pour into a dry cask and leave loosely bunged until fermentation stops; then tighten up and leave for three months. At the end of that time prepare another cask and draw the wine off into it, at the same time adding a pint of brandy. Bung down, and after twelve months bottle.

Mango Wine No. 1.

Choose very ripe fruit. Put them in an earthenware vessel or cask without removing either the skins or seeds. Cover with water and allow to stand for three days. Stir or squeeze the fruit three times a day until the flesh leaves the seeds. At the end of this period strain the mash through a fine cloth and measure it. To every gallon of juice allow 3½ lb. sugar. When this is dissolved pour the wine into bottles, but do not cork them. Allow to ferment, each day filling the bottles with liquor retained for the purpose. When fermentation stops cork the bottles and put them away. The longer this is kept the better it becomes.

Mango Wine No. 2.

Select ripe fruit and place them in a wooden tub or cask with one end knocked out. Bruise the fruit well and pour in 1 gallon water for every 10 lb. to 12 lb. of fruit. Let stand for forty-eight hours, then strain and measure into a cask. For every gallon of liquor add 2 lb. to 2½ lb. of white sugar, according to the sweetness of the fruit used. Set aside to ferment, and when this is complete add ½ pint of rum or brandy for each gallon of wine and bung down tightly. After nine to twelve months bottle it off. The wine will be fit to drink in about six months, but if kept longer it will be better.

Granadilla Wine.

To make 5 gallons of wine mash ten medium-sized granadillas, fully ripe, and well cover with water in an earthenware or wooden vessel. Let stand forty-eight hours, then strain off. Dissolve 10 to 12 lb. sugar in hot water, and add to the juice while warm, and add sufficient more warm water to make up 5½ gallons of liquor. Pour into a cask and keep the extra ½ gallon aside for filling as the fermentative process reduces the level of the wine each day. When fermentation is finished, which should be in about three weeks, 2 pints of brandy may be added and the bung driven in. The wine may be bottled off in nine to twelve months.

Pineapple Wine.

Mash 10 lb. ripe pineapples, including the skins, and cover with 2 gallons water. Let stand twenty-four to forty-eight hours, then strain off. Add 6 lb. sugar and stir till dissolved, then strain off into a keg or earthenware demijohn. When fermentation is complete seal down. The wine may be bottled off after six months.

Mulberry Wine.

Use quite ripe fruit, and to every pound of mulberries add 1 gallon water. Stir well, and leave for twenty-four hours. Strain, and to every gallon of juice add 3½ lb. sugar. When dissolved put the liquor into a cask. When fermentation has ceased bung tightly. Three months later the wine may be bottled off, adding three cloves and a lump of sugar to each bottle. It should then be stored away for a year.

Strawberry Wine No. 1.

To 1 quart of strawberry juice add 1 quart of water and 1 lb. sugar, and stir well. Strain and allow to ferment in an open jar. When fermentation is complete, draw off and bottle. Set the bottles aside for at least six months.

Strawberry Wine No. 2.

Take 3½ gallons cold water, 3 gallons cider, and 3 gallons strawberry juice. Ferment, then add 8 lb. sugar, 1½ oz. red tartar finely ground, juice and rind of one lemon, and 1 quart of brandy. This will make 9 gallons of wine. For strawberry wine the fruit should be picked in fine weather after several fine days.

Raspberry Wine.

Gather the fruit when quite ripe, bruise and strain the juice through a bag. Boil the juice in an enamel pan, and for every gallon add 1½ lb. sugar. Also add the whites of one to three eggs, according to the quantity to be made. Let this boil for fifteen minutes, skimming it as the froth rises. When cold and settled decant into a cask, adding a bottle of yeast to aid fermentation. When this is complete add 1 pint of white wine or ½ pint of proof spirits to each gallon, and hang in the cask a bag containing 1 oz. of bruised mace. Keep the cask in a cool place. The wine should be fit for use after three months. This wine may be made from the wild raspberries which grow prolifically throughout Queensland.

Rosella Wine No. 1

Put the fruit into a wooden tub and pour over it boiling water rather more than sufficient to cover it. Let stand for three days, stirring now and then. Strain off and measure. For every gallon of juice take 3 lb. of sugar and make into a thick syrup with boiling water. Pour this into the juice while still hot and stir well. Pour into a cask, filling almost to the bung hole, and allow to ferment. If fermentation does not start within twenty-four hours add a bottle of yeast. When fermentation is complete, bung up and leave for three months, when it will be ready to draw off and bottle.

Rosella Wine No. 2.

To 1 gallon of rosellas add 1 gallon of water. Let stand twenty-four hours, then add 4 lb. sugar, ½ oz. allspice, ½ oz. whole ginger, ½ oz. cloves tied in a muslin bag. Boil steadily for one hour, then strain off. When cold, bottle, seal, and put away in a dark place for six months.

Raisin Wine.

Take 10 lb. raisins and 1 lb. sugar. Pick the raisins clean and chop them fine. Pour 1 gallon of hot water on them and press the juice through a bag. Let stand for twelve hours, then add the sugar and leave to ferment. When fermentation is complete cask and bung up. After three months draw off into another cask and bung it closely. Bottle off in ten months, and it will be fit to drink in a year.

Fat Lamb Raising

FARMERS' WOOL SCHEME.

THE Minister for Agriculture and Stock (Mr. Frank W. Bulcock) in a recent statement commented on the objects of the Farmers' Wool Scheme now in operation in his Department.

Recognising the economic loss suffered by owners of small lines of sheep in the matter of wool values received, the Department inaugurated this scheme some fifteen years ago. Broadly, its objects are to receive small lines of wool in bales, bags, butts, or fadges, and to class these wools, as an accumulation offers, into lines sufficiently large to be taken out of star lots, and to merit offer in the main catalogue, where it meets with world competition. Results have been highly satisfactory, and the prices received, when the nature of the wools handled is taken into consideration, have been an object lesson in the profits to be derived from scientific and honest classing. As an instance of the benefits of the scheme, the Minister referred to the results of the January series of sales in Brisbane, where the average for the whole of the sale (50,000 bales) was 14·99 pence per lb., and the departmental offer of 107 bales averaged 14·8 pence per lb.

The Minister, in outlining the scheme, pointed out that wool consigned to the Department was immediately weighed and valued, and the consignor received an advance of 60 per cent. of the estimated value free of interest. This advance is made in view of the fact that it is sometimes necessary to hold wool for a period for the purpose of matching it with similar wools, in order to achieve the objects and benefits of the scheme. The wool is then scientifically classed, and every pound of wool is handled, even the locks going over the table. The wool is sold as soon as practicable by brokers selected in rotation, and after the sale the moneys are distributed pro rata, less the handling costs, which consist of railage, road carriage, brokerage, and a service charge of 10s. per bale of 250 lb. This charge does no more than meet the cost of the service. The work involved in the administration of the scheme is carried out under the supervision of an officer of the Department attached to the Sheep and Wool Branch. The Wool Room is an up-to-date structure, specially lighted and fitted with the necessary appliances for handling the staple, and in view of the increase in the amount of wool handled, it was necessary to recently install an up-to-date electrical power press.

As an example of the diversity of wools handled, it may be mentioned that, whereas an ordinary merino clip would class into, say, fourteen or fifteen lines, no less than eighty-six classes in merino come-back and crossbred were dealt with by the Department last year.

Mr. Bulcock pointed out that this scheme was for the benefit of the smaller owner, and was limited to clips from holdings carrying less than 1,500 merino sheep. The scheme, however, has also been extended to permit of the receipt of wool from crossbred and British breeds from any holding. Bags and butts are also taken from any holding, and arrangements are made with the selling agents to submit star lots received by them for inclusion in the catalogue, thus ensuring the consignors of these lots a better return.

* * *

QUEENSLAND SHOW DATES.

March.

Allora, 4th and 5th.
Milmerran, 6th.
Oakey, 7th.
Pittsworth, 11th and 12th.
Goombungee, 13th.
Warwick, 18th and 19th.
Toowoomba, 23rd to 26th.

April.

Crow's Nest, 1st and 2nd.
Dalby, 1st and 2nd.
Chinchilla, 7th and 8th.
Tara, 15th and 16th.
Nanango, 16th and 17th.
Miles, 15th.
Kingaroy, 22nd to 24th.
Wallumbilla, 28th and 29th.
Monto, 29th and 30th.
Wondai, 30th April and 1st May.

May.

Goondiwindi, 1st and 2nd.
Longreach, 4th to 7th.
Taroom, 4th to 6th.
Mundubbera, 6th and 7th.
Charleville, 5th to 7th.
Beaudesert Show, 6th and 7th.
Beaudesert Camp Draft, 8th and 9th.
Biloela, 7th, 8th, and 9th.
Wowan, 14th, 15th and 16th (Camp Draft).
Murgon, 7th to 9th.
Goomeri, 13th and 14th.
Mitchell, 13th and 14th.
Ipswich, 19th to 22nd.
Roma, 19th to 21st.
Biggenden, 21st and 22nd.
Gympie, 22nd and 23rd.
Warrill View, 23rd.
Maryborough, 26th to 28th.
Toogoolawah, 29th and 30th.
Kalbar, 30th.

June.

Childers, 1st and 2nd.
Marburg, 6th and 8th.
Bundaberg, 4th to 6th.
Lowood, 5th and 6th.
Boonah, 10th and 11th.
Esk, 12th and 13th.
Rockhampton, 23rd to 27th.
Laidley, 24th and 25th.
Marburg, 27th and 29th.
Mackay, 30th June, 1st and 2nd July.

July.

Bowen, 8th and 9th.
Townsville, 14th to 16th.
Cleveland, 10th and 11th.
Ayr, 10th and 11th.
Rosewood, 10th and 11th.
Nambour, 16th to 18th.
Cairns, 21st to 23rd.
Maleny, 23rd and 24th.
Gatton, 29th and 30th.
Caboolture, 31st July and 1st August.

August.

Pine Rivers, 7th and 8th.
Royal National, 17th to 22nd.
Home Hill, 28th and 29th.

September.

Tully, 11th and 12th.
Innisfail, 18th and 19th.
Southport, 26th.

VETERINARY MEDICINES ACT.

ANNUAL REGISTRATION LIST, 1936.

THE requirements of the Veterinary Medicines Act relating to registrations have been met within the specified time limit in respect of the veterinary medicines listed as follows:—

	Reg. No.
A. C. F. and Shirley's Fertilizer Ltd., Little Roma street, Brisbane—	
Andrew Dryden's Famous Blood and Water Powders	446
Andrew Dryden's Famous Embrocation	447
Andrew Dryden's Famous Gripe Drench	448
Andrew Dryden's Famous Liquid Blister	449
Andrew Dryden's Famous Scour in Calves	451
Andrew Dryden's Famous Specific	450
Andrew Dryden's Famous Worm and Condition Powders	452
Dairy Ointment	454
Dryden's Cleansing Drench for Cattle	455
Dryden's Gall Cure	456
Dryden's Invaluable Specific (Warts on Poultry)	453
Australian Chemical Co., Donkin street, South Brisbane—	
Acco Special Sedative Drench	61
Acco Savol	62
Acco Tetrachloride Drench	59
Kreeola Tetrachloride Drench	60
Australian Disinfectant Co., Albert street, Brisbane—	
Safonia	400
Wagstaff's Stock Drench	471
Berry and Co., Pty., Ltd., Henry, Adelaide street, Brisbane—	
Carbox	345
Bickford and Sons, Ltd., A. M., Tank street, Brisbane—	
Bone-Radiol	45
Radiol	44
Radiol Leg-wash Powder	46
Radiol Kidney Powder	439
Bryce Ltd., Adelaide street, Brisbane—	
Bio Blackleg Pellets	171
Pegasol	249
Pegasus Blackleg Aggression (Liquid)	172
Pegasus Gall Cure	173
Pegasus Mammitis Toxiculture	174
Pegasus Stock Drench	175
Pegasus Vaginitis Capsules	176
Pegasus Worm Drench for Horses	177
Campbell Bros., Pty., Ltd., Bowen Hills, Brisbane—	
Safa	413
Dalgety and Co., Elizabeth street, Brisbane—	
Sayer's Green Seal Drench for Fluke, &c. (Single Strength)	162
Sayer's Green Seal Drench for Stomach Worms, &c. (Double Strength)	163
Dryden, Victor, 10 William street, Lutwyche—	
Gall Ointment	27
Victor Dryden's Embrocation	29
Victor Dryden's Liquid Blister	31
Victor Dryden's Poultry Specific	32
Victor Dryden's Scour in Calves	33
Victor Dryden's Specific	34
Victor Dryden's Worm and Condition Powders	35
Evans Products Agency, Dayboro'—	
Evans Scour Cure	278
Evans Mammitis Treatment	1131

	Reg. No.
Moss and Co., T. W., 121 Eagle street, Brisbane—	
Bronkos Cough Paste	478
Osmond and Sons Life Saving Red Draught	329
Osmond's Antiseptic Pessaries	134
Osmond's Bot Capsules	210
Osmond's Brown Draught	1073
Osmond's Cattle Oils	348
Osmond's Cattle Shampoo	1132
Osmond's Fluid Zenos Disinfectant	337
Osmond's Fluke Kill (Double Strength)	432
Osmond's Fluke Kill (Single Strength)	431
Osmond's Foot Rot Paste	1074
Osmond's Oxygas	409
Osmond's Pig Powders	347
Osmond's Saltonia Blood Salt	330
Osmond's Special Scour Cordial	481
Osmond's Special Worm Drink for Horses	482
Osmond's Vaccadyne	331
Noble and Sinnamon, W. A., Toowoomba—	
Noble's Aperient Pills for Large Dogs	213
Noble's Aperient Pills for Small Dogs	212
Noble's Blight Lotion	80
Noble's Cleansing and Dairy Drench	79
Noble's Dog Alterative	160
Noble's Mange Oil	161
Noble's Physic Balls for Horses and Cattle	434
Noble's Poultry Powder	81
Noble's Scour Remedy for Calves	82
Noble's Tonic, Alterative, and Condition Powders	426
Noble's Vettoll	83
Noble's Worm and Condition Pills (Large Dogs)	215
Noble's Worm and Condition Pills (Small Dogs)	214
Noble's Worm Specific for Puppies	84
Noble's, Pty., Ltd., Eagle street, Brisbane—	
Contagious Vaginitis Ointment	36
Sykes's Animal Colic Remedy	37
Sykes's Animol	38
Sykes's Concentrated Animal Chemical Food	39
Sykes's Creatol	40
Sykes's Drench	41
Sykes's Farm and Home Embrocation	42
Sykes's Udderine	43
Poultry Farmers' Co-operative Society Ltd., Roma street, Brisbane—	
"Healo"	48
"Red Comb" Bronchitis Cure	49
"Red Comb" Chick Tonic	50
"Red Comb" Cleansing and Tonic Drench	51
"Red Comb" Eye Roup Cure	52
"Red Comb" Fowl Pox Vaccine (Attenuated)	76
"Red Comb" Iodine Specific	470
"Red Comb" Roup Cure	53
"Red Comb" Scaly Leg Ointment	54
"Red Comb" Veterinary Iodine	55
"Red Comb" Wart Preventative	56
"Red Comb" Worm and Condition Powders	57
"Red Comb" Worm Capsules	75
"Red Comb" Worm Killer	436
Vitone	437
Puritan Packing Co., Bowen Hills, Brisbane—	
Vetonia	412
Queensland Chemical Distributing Co., 111 Elizabeth street, Brisbane—	
Nopara Dual Liver Fluke and Worm Remedy	136

	Reg. No.
Queensland Pastoral Supplies Ltd., Bowen street, Brisbane—	
Hibiscus Carbon Tetrachloride Fluke Branch	264
Robinson and Bott, Pty., Ltd., Adelaide street, Brisbane—	
Rawleigh's Colic and Bloat Ease	23
Rawleigh's Poultry Powder	232
Rawleigh's Roup Powder	129
Rawleigh's Stock Tonic	233
Rawleigh's Veterinary Embrocation	24
Salmond and Spraggon (Aust.) Ltd., Eagle street, Brisbane—	
Bob Martin's '92 Ointment	421
Bob Martin's Antiseptic Dog Soap	429
Bob Martin's Tasteless Condition Powders	399
Bob Martin's Tasteless Distemper Powders	422
Bob Martin's Worm Tablets	419
Bob Martin's Worm Powders	420
Elliman's Royal Embrocation	47
Spedosol Supply Co., Queen street, Brisbane—	
Spedosol Powder	26
Surgical Supplies Ltd., Queen street, Brisbane—	
Alterative Worm and Condition Powders	137
Dr. Metcalfe Sharpe's Application	138
Dutton's Mange Specific	139
Dutton's Redwater Cure	140
Equine Cough Syrup	141
Gripe Drench	216
Scour Powders	142
Spavin Paste	217
Special Bull Tonic	143
SS Antiseptic Vaginal Kugloids	144
SS Black Oil	145
SS Blight Powder	146
SS Heal-all Ointment	147
SS Lung Worm Specific	148
SS Reliable Embrocation	149
SS Scour Cure	150
SS Tonic Powder	151
SS Udder Specific	152
Surgical Supplies Blister	153
Surgical Supplies Dairy Ointment	154
Surgical Supplies Gall Cure	218
Surgical Supplies Ltd. Cleansing Drench	155
Surgical Supplies Ltd. Lampas Cure	156
Surgical Supplies Ltd. Worm Powders for Horses	157
Veterinary Blood and Water Powders	158
Wart and Horn Solvent	159
Taylors, Elliotts, and Australian Drug Pty, Ltd., 154 Charlotte street, Brisbane—	
"Austral" Aloetic Physic Ball	94
"Austral" Arsenic and Copper Worm Drench for Sheep	73
"Austral" Barb Wire Embrocation	95
"Austral" Blood and Water Drench	96
"Austral" Calcifer Powder	97
"Austral" Calcifer Solution	98
"Austral" Caustic Stick	99
"Austral" Cleansing Drench	100
"Austral" Cooling Lotion	101
"Austral" Dairy Ointment	102
"Austral" Dusting Powder	103
"Austral" Eye Blight Tablets	104
"Austral" Gall Ointment	105
"Austral" Garget Powder	106
"Austral" Gripe Drench	107

	Reg. No.
Taylors, Elliotts, and Australian Drug Pty., Ltd., 154 Charlotte street, Brisbane—*continued.*	
"Austral" Horse Blister	108
"Austral" Iodine Capsules	109
"Austral" Liquid Blister	110
"Austral" Lung Worm Drench	74
"Austral" Mange Dressing	111
"Austral" Pig Cough Powder	112
"Austral" Pig Purgative Powder	113
"Austral" Pig Worm Powders	114
"Austral" Regulating Drench	115
"Austral" Ringworm Ointment	116
"Austral" Scour Drench	117
"Austral" Trypan Blue	118
"Austral" Vaginal Douche Powders	119
"Austral" Vaginal Pessaries	120
"Austral" Veterinary Embrocation	121
"Austral" Wart Paint	122
"Austral" Worm and Condition Powders	123
Barko Tasteless Condition Powders	124
Bickmore's Gall Cure	125
Butler's Leeming's Essence	378
Doyle's Distemper Mixture	167
Doyle's Laryngine	168
Doyle's Skin Dressing	169
Lieut. James's Blistering Ointment	279
Reducine	170
Row's Embrocation	130
Skinner's Cleansing and Tonic Drench	127
Skinner's Ointment	126
Stevens's Ointment	433
Weaver's Sheep Drench	411
Tudor, H. G., Toowoomba—	
Stock Cough Paste	181
Vaginitis Powder	166
Webster and Co., Pty., Ltd., Mary street, Brisbane—	
Carbene	1063
Cee-Tee-Cee	1064
Mag-O-Tol	461
Wurmettes	462
Wurm-Ez-Ol	1062
Wilcox, Mofflin, Ltd., Longland street, Brisbane—	
Cesto Tapeworm Drench	336
Red Spot Double Strength	225
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Tri Kos	1130
Wilmolene	227
Winchcombe, Carson, Ltd., Eagle street, Brisbane—	
Anti Mammitis	343
Bailey's Amolene Ointment	342

SUCCESS.

Success is a hard castle to take. The walls are impregnable. You cannot make a breach in them. There is only one way in. That is by the gate of hard work, the key of which is enthusiasm.—Sir Walter Plummer.

Agriculture in Other Countries.*

Subjoined is a summary of conclusions drawn by Mr. W. J. Spafford, Deputy Director of Agriculture, South Australia, from investigations made by him during a recent tour of portions of the principal agricultural countries in the same climatic zones as the settled portions of Australia. Mr. Spafford was commissioned by the South Australian Government to inquire into and report on production and preparation for marketing of agricultural products, including crops and livestock in South America, South Africa, and New Zealand.

BESIDES being a beautiful country, New Zealand is a remarkably good agricultural country, particularly as regards the production of dairy produce and sheep for meat.

In all probability the best pastures in the world are to be found in New Zealand, the natural conditions encouraging the full growth of pasture plants, and the farmers being extremely efficient managers of pasture lands.

The seed certification scheme, as inaugurated in New Zealand, and developed and controlled by the Department of Agriculture, is playing a great part in the improvement of New Zealand pastures.

The Meat Producers' Board of New Zealand has been functioning for thirteen years, and so successful have its efforts been that it is the envy of most meat-exporting countries. Producers are adequately represented on this Board, for five of the eight members are direct representatives of meat producers.

Co-operation is very important in the dairying industry of New Zealand, and it appears that much of the success attained in this branch of agriculture is due to this fact.

We have so much to learn from New Zealand in connection with pastures, dairying, fat lambs, and co-operation that officers of the Department of Agriculture should be sent more frequently than in the past to that country, to get first-hand knowledge of the progress being made.

Chile is a direct competitor with Australia with wines and barley, and although the agriculture is rather backward in some directions, has great potentialities for the production of all Mediterranean-climate crops. It appears, however, that the development of her agricultural resources cannot be brought about quickly, and, further, she is handicapped in a similar manner to Australia in the time taken to place primary products on the European markets.

Argentina is such a wonderful agricultural country that she could, if allowed, swamp the markets of the world in which Australia is interested, with all the agricultural products which are produced in the temperate and sub-tropical portions of the Southern Hemisphere, except merino wool.

The greatest competitor of Australia at the moment, Argentina is likely to become still greater as time goes on.

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* From *Agriculture in the Temperate and Sub-Tropical Climates of the South,* Bulletin No. 310, by W. J. Spafford, Deputy Director of Agriculture, South Australia, reprinted from the *Journal of Agriculture of South Australia*, 1936.

To be able to contend with the competition of Argentina Australia is dependent upon the political advantage she has in being one of the units of the British Empire.

It will be necessary to extend the political advantage of Australia to enable her to meet the increasing competition from Argentina, and this can probably be done best by forming a close association with other outlying parts of the Empire, and more particularly those in the Southern Hemisphere, of which the most important are New Zealand and South Africa.

To encourage Great Britain still further to purchase Empire products in preference to foreign an effort should be made to balance the trade to and from that country. Other things being at all equal preference should be given to the purchase of goods from the United Kingdom.

Although Uruguay maintains a fair number of sheep and is an exporter of wool and sheep meat, it does not appear as though this country can ever develop into an important competitor of Australia with any agricultural product.

Southern Brazil exports a lot of oranges to Europe, and is constantly increasing supplies, but being of the type produced in sub-tropical climate, they do not compete directly with Australian export oranges.

Zebu cattle and their crossbreds are giving complete satisfaction in the tropical parts of Southern Brazil, and will probably do the same for the portions of Australia with similar climatic conditions.

Throughout South America livestock for slaughter are sold by live weight—a method which ensures that the producer gets paid for what he produces, and at the same time simplifies things for the buyer.

South Africa is a direct and important competitor with Australia with merino wool, and it appears that her wool industry would be improved by the lifting of the embargo on the exportation of stud merino sheep from Australia.

Everything possible should be done towards retaining the most friendly relationships with South Africa, for it appears that it will take the combined efforts of New Zealand, South Africa, Australia, and other parts of the Empire located in the Southern Hemisphere to compete successfully with South America.

Arising from the tour of portions of the Southern Hemisphere is one conclusion which overshadows all others, and that is that the competition now being faced by Australia from South American products will get greater and greater in the near future, and that the sooner steps are taken to combat it the better. In this connection the following suggestions are made:—

(*a*) A serious endeavour should be made to balance the trade between the United Kingdom and Australia by purchasing goods made in Great Britain whenever possible.

(*b*) A close trade association between the parts of the Empire located in the Southern Hemisphere should be developed as soon as possible.

(*c*) To educate agriculturists in the needs, aims, production, and practices of the various parts of the Empire an Empire Agricultural Convention should be organised to meet every year, or at least every second year, in one or other of the Empire countries.

(*d*) Australia, being dependent upon its agriculture, and the progress of agriculture being dependent upon selling overseas, every effort should be made to produce and prepare articles of a quality to retain any market once gained. This can be done by very rigid inspection to high standards of quality at ports of embarkation, and helped by attaching to all Departments of Agriculture a commercial branch to advise agriculturists on market requirements, current prices, co-operation, &c.

(*e*) To help counteract the wonderful natural advantages of South America the cost of production of agricultural produce must be lowered, which can only be done by increasing the yield per unit. To do this agriculturists must be kept abreast of the times, and so a fully-staffed, efficient Department of Agriculture, including officers for field crops, horticulture, viticulture, veterinary science, cattle, sheep, pigs, wool, poultry, bees, irrigation, and marketing, must be maintained at all times.

(*f*) In South Australia (this applies to Queensland, also—Ed.), where manufacturing advantages are not great, the development by the people of an agricultural outlook would help maintain an export balance.

EMPTYING THE DIP.

With the approach of the dipping season many farmers whose dips are not fitted with waste pipes will be confronted with the task of emptying their dips by hand. Here is a way to lighten the labour. Put a tall post in at the side of the dip, and on this, by means of a chain, hang a free-moving beam. To one end of the beam hang a sack of stones and to the other a 10-gallon (or larger size) drum. The rest is simple.

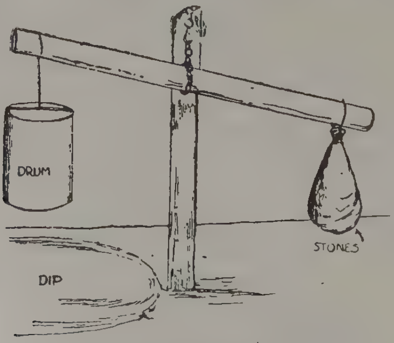


PLATE 92.

Agricultural Notes

Sorghum Poisoning.

IN view of the numerous inquiries received from farmers regarding the poisonous properties of immature sorghum, attention is drawn to the characteristics of the chief types in general cultivation.

All grasses of the sorghum family, which includes Sudan grass, Johnson grass, the sweet or saccharine sorghums, such as Saccaline, and the grain sorghums represented by Feterita, contain a hydrocyanic acid-yielding glucoside, usually termed prussic acid, or HCN, which is often responsible for fatalities among stock where reasonable precautions are not adopted.

The poison is chiefly concentrated in the young stalks, and persists in decreasing quantities as the plant grows, entirely disappearing by the time maturity is reached. Stock should, therefore, never be allowed access to immature sorghum, especially if wilted through dry weather. Second growth and immature frosted material is also dangerous. It is safe to feed the young growth if cut and allowed to dry, but as sorghums are most palatable and nutritious when the grain is in the milky stage, this is obviously the most opportune time to cut for silage or fodder purposes. Once the heads are well out, stock can be grazed or fed with safety.

Sudan grass is largely grown as a grazing crop, and many farmers have successfully fed this grass to stock in all stages for many years. It contains approximately one-quarter as much HCN as sorghum at corresponding periods of growth, and farmers should therefore feed with caution in hot dry weather, and not turn in hungry stock to graze.

It is important to secure pure seed, as all sorghums hybridise readily, and fatalities have been reported, possibly as a result of using hybrid seed.

Johnson grass is distinctly poisonous, as it contains a greater quantity of HCN than any of the cultivated sorghums. This grass should be eradicated wherever possible, as it spreads rapidly from roots and seed. The seed is difficult to distinguish apart from Sudan seed, but the plant can always be identified, owing to its deep rooting habit, whereas Sudan grass has shallow fibrous roots.

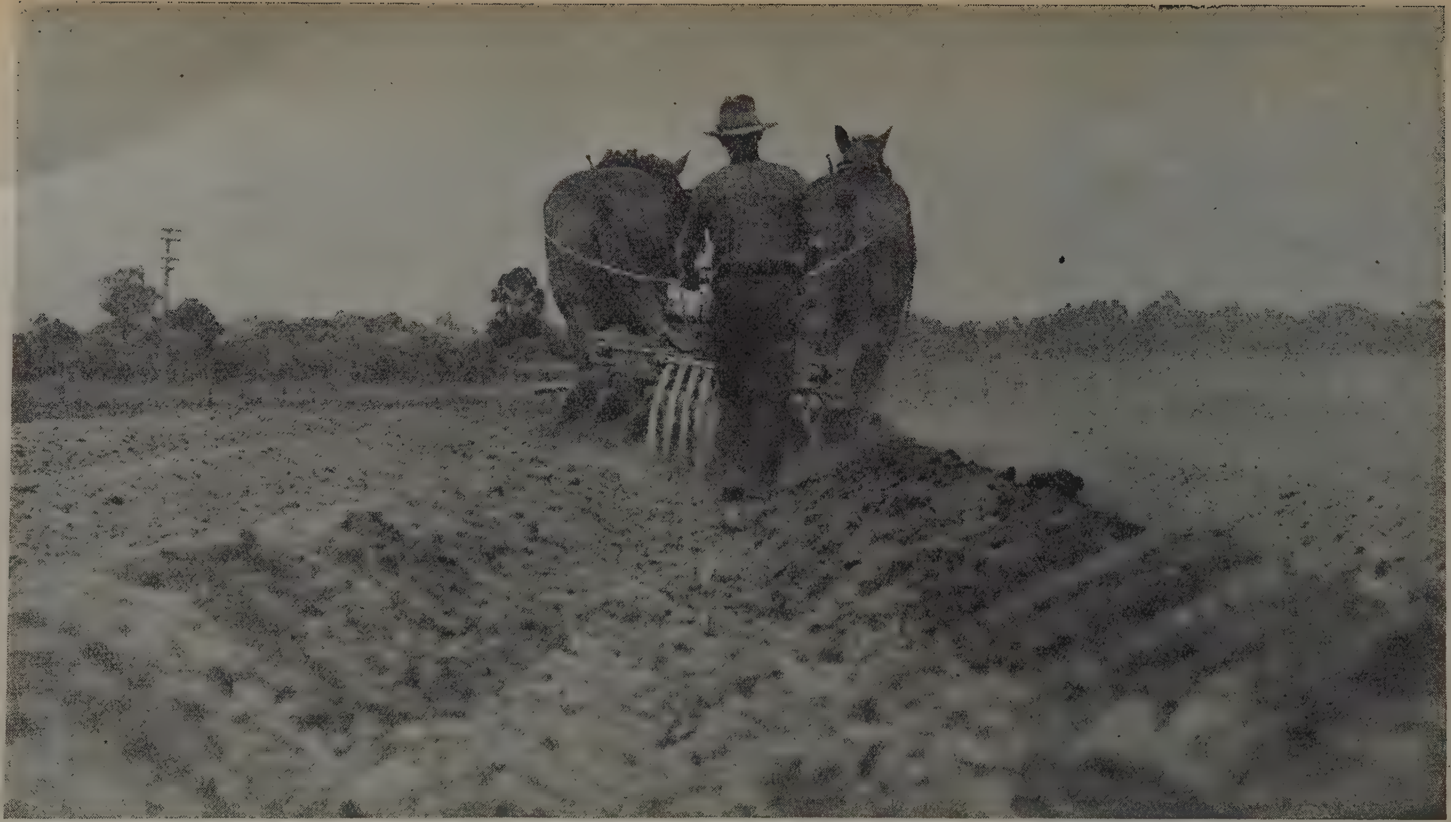


PLATE 93.
Cleaning a cane furrow with a "Cotton King" and rake attachment—Sugar Experiment Station, Mackay.

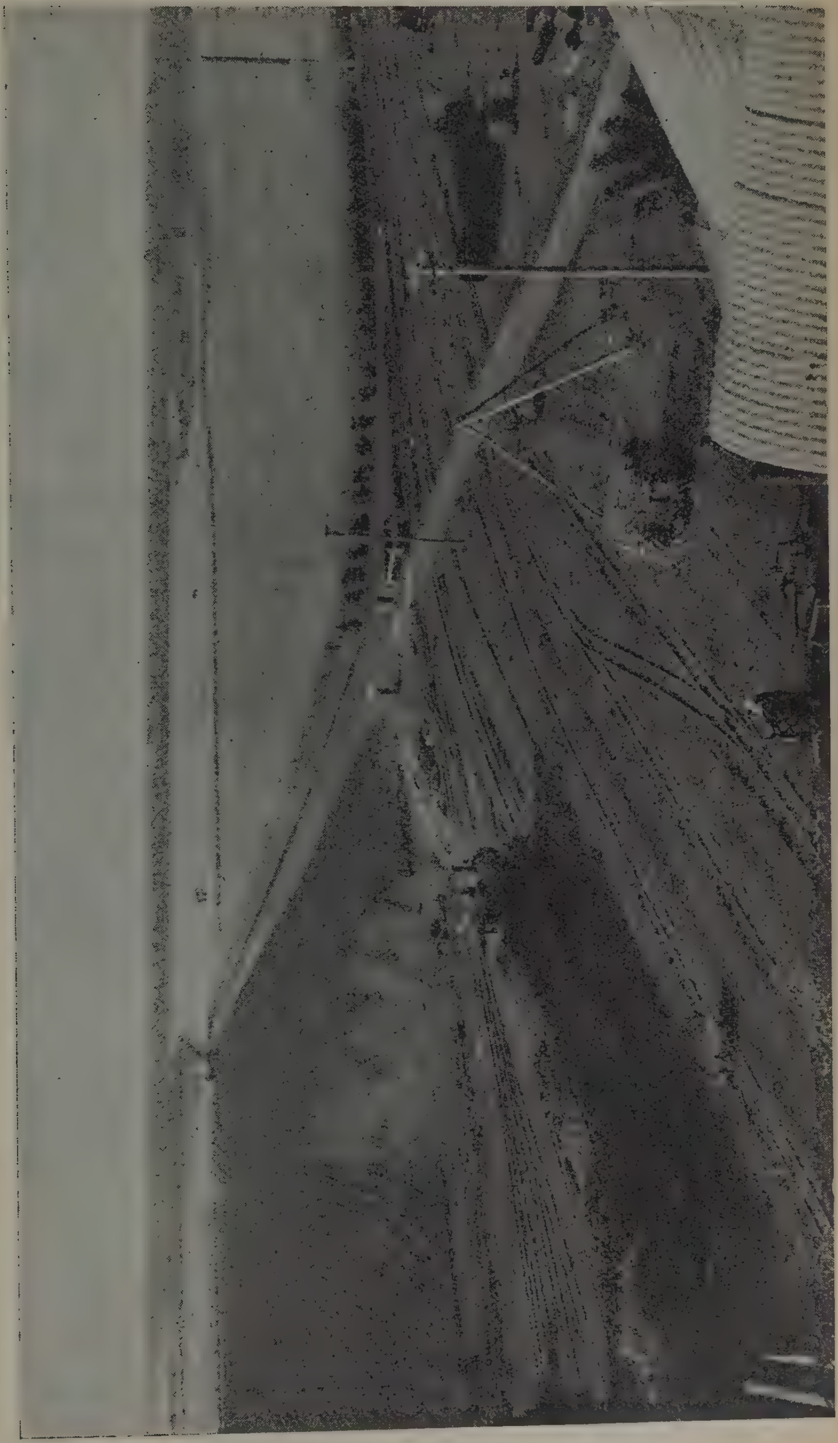


Plate 94.
Overlooking a portion of Bingera Plantation, near Bundaberg.

Tobacco.

Once again splendid rains have been received in all tobacco districts, and from reports received, all areas with the exception of Mackay and Sarina give promise of returning splendid yields. In this latter district, the excessive rainfall has caused considerable damage, the result of which will not be known until conditions improve.

Curing is now in full swing at Texas and Miriam Vale, and leaf harvested to date is of fairly good quality. Apart from severe outbreaks of mould in isolated areas at the commencement of the season, disease has not been troublesome. Of the pests, the stem grub is again causing considerable trouble, necessitating the continual cutting back of affected plants.

Cotton.

The progress of the cotton crop during February has been rather irregular, according to the amount and frequency of rainfall experienced. Broadly speaking, in the districts which have received good rains during the month, fairly satisfactory development has occurred, and many crops give promise of yielding very good returns if favourable conditions are experienced for the rest of the season. In the districts which did not receive rains, the crop prospects are not so satisfactory, however, some shedding of the flower buds and young bolls having taken place, and unless good rains are soon experienced, the development of the plants will be seriously checked. Soaking rains would be acceptable, therefore, in all the cotton districts.

PLATE 95.
Giant rotary hoe chopping out old cane stools, Fairymead Plantation, Bundaberg—A 75-h.p. caterpillar tractor provides the power.

The earliest-planted crops have started opening during the month, and harvesting operations are under way in all districts. The ginneries at Glenmore and Whinstanes were opened on the 24th to receive cotton.

Sugar.

With the exception of the southern districts, heavy rains were experienced throughout the cane areas during February. To date no serious flood damage has been reported, and it may be assumed that crops will benefit widely from the downpours.

Prospects for the 1936 crop are at the present time very bright.

Plate 96.

W. R. Tulip XII. (H.B. No. 6989).

Tulip XII. is the "star producer" in the dairy herd of Westbrook Farm Home for Boys, near Toowoomba. She was first in Queensland for all cows completing their tests in January last. During her test she was milked at regular hours twice daily, and had no feed other than that produced on the farm. Five different boys had charge of her in the course of the test, and had she been forced and milked solely by one experienced milker throughout it is probable that her production would have been even greater. She is by Westbrook Councillor II. (2047) ex Montrose Tulip IV. (1436), and was Champion Jersey Cow at Toowoomba last year. The Superintendent of Westbrook, Mr. Thos. Jones, received recently the calf roll entry for Westbrook Tulip 71, all bred from Montrose Tulip IV., the dam of Westbrook XII. Some little time ago one of this family was the highest producer in the Affleck Cup competition for Queensland.

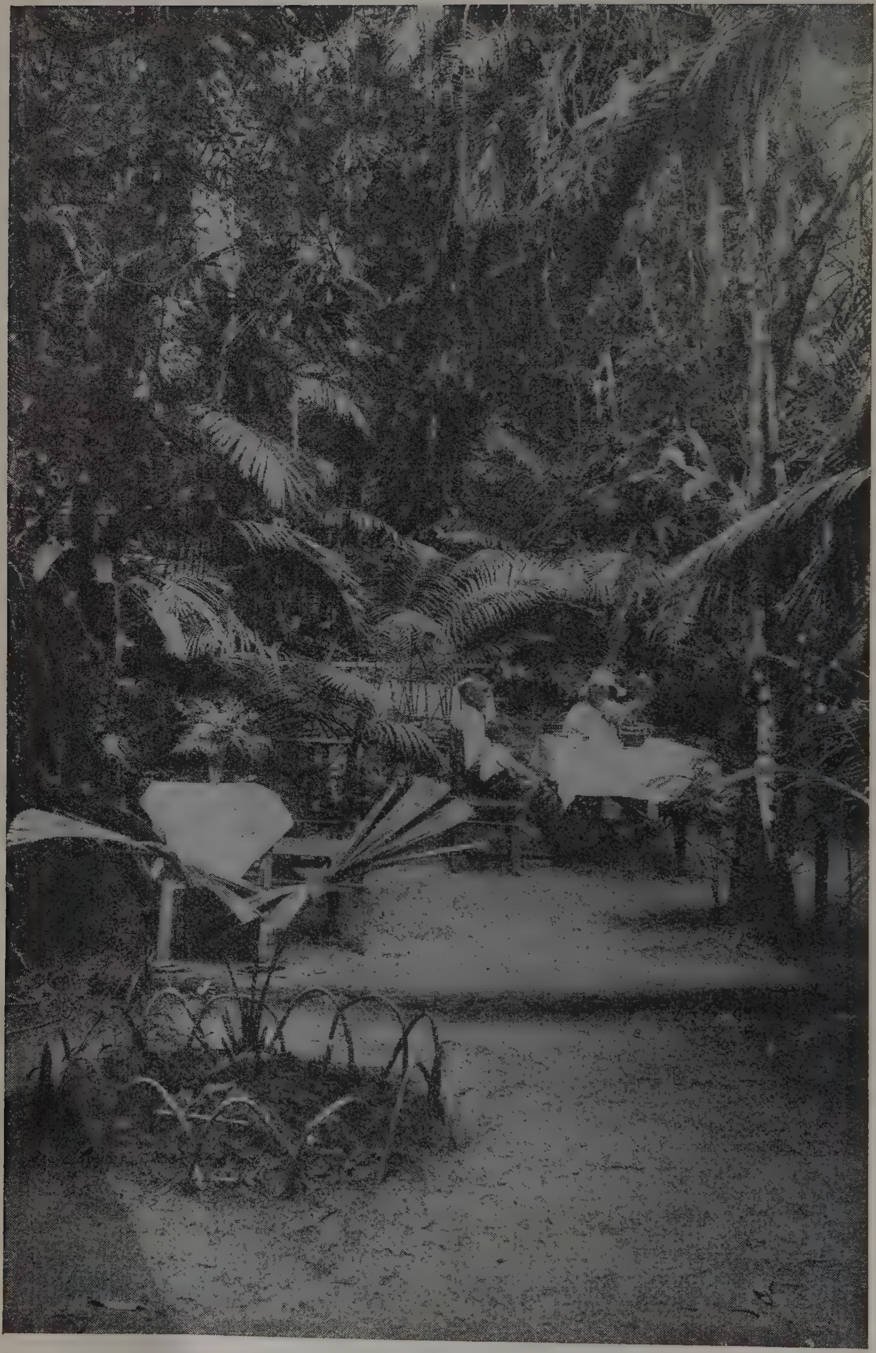


PLATE 97.
The Tea Gardens, "Fairyland," Kuranda.

Plate 98.
On the Herbert River at Macknade, near Ingham, North Queensland.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of January, 1936 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Plum 3rd of Hawthorn (264 days)	H. M. Graham, Goomeri	9,137·9	369·369	General of Croydon
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Rhodesview Kitty 7th	W. Gierke and Sons, Helidon	9,043·71	394·593	Blacklands Prospector
Glencairn Pearl (271 days)	H. M. Graham, Goomeri	7,248·07	316·9	Roslyn of Woodmerle
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Kingsley Pigeon II.	S. L. Holmes, Goomburra	7,558·29	275·257	Glimpse of Blacklands.
	JERSEY.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Westbrook Tulip 12th	Farm Home for Boys, Westbrook	9,404·35	502·117	Westbrook Councillor 2nd
	JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.			
Myrtle of Glencairn (270 days)	C. Huey, Sabine	5,859·65	326·677	Trecarne Farm Lad
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Bellgarth Roselea	D. R. Hutton, Cunningham	5,759·25	341·124	Bellfaire Blondes Bellringer
Bellgarth Birthday	R. D. Hutton, Cunningham	6,116·75	331·591	Bellfaire Blondes Bellringer
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Bellgarth Madora 2nd	D. R. Hutton, Cunningham	5,703·48	296·158	Bellfaire Blondes Bellringer

Junior, 2 Years (under 2½ Yaers), Standard 230 Lb.

Kathleigh Sunflower	F. W. Kath, Ellesmere	6,502·8	347·734	Retford King's Thorn
Kathleigh Florrie	F. W. Kath, Ellesmere	6,989·9	334·572	Acrefail of Banyule
Kathleigh Christmas	F. W. Kath, Ellesmere	5,526·5	317·926	Retford King's Thorn
Pineview Poppy	J. Hunter and Sons, Borallon	4,772·74	286·107	Pineview Starbright
Pineview Lady	J. Hunter and Sons, Borallon	4,883·77	253·34	Oxford Jeweller
Cleeve Jeanette	R. A. Slaughter, Clifton	4,471	238·378	Trecarne Larkboy

In Memoriam.

MR. LOUIS GEORGE JONES.

The Department of Agriculture and Stock lost a valued officer by the death of Mr. L. G. Jones, on 9th January after a brief illness, and which is recorded with profound regret.

The late Mr. Jones was born in 1872 at Oatlands, Tasmania, where his grandfather, the late Robert Jones, was a pioneer grazier. His father, the late William Jones, was among the first to establish a flock of Corriedale sheep which he bred on his well-known property, Ballochmyle. So from his earliest years the late L. G. Jones was associated with rural pursuits, stock raising particularly, in one way or another. For some years he was engaged in the pastoral industry in New South Wales. Coming to Queensland, he settled near Jericho in the Central Division of the State.

Invalided from active service overseas with the 41st Battalion, Australian Imperial Force, he joined the Commercial Branch of the Department in 1917. For a time he held an appointment as officer under the Animals and Birds Acts, and subsequently as Quarantine Officer (Plants). He was noted for his high sense of duty, assiduity, and complete dependability in everything he undertook. These and other fine qualities, added to an innate courtesy, won for him many friends, especially among those with whom he had dealings from day to day.

By nature an earnest student, he interested himself closely in stock and plant problems, and this interest continued as an absorbing hobby until the end. He was the author of a number of publications relating to stock breeding and management, including "The Flockmaster's Companion" and "Stock Breeding Simplified."

In the presence of many sorrowing friends, including departmental colleagues and comrades of his old battalion, the late Mr. Jones was laid to rest in the Lutwyche Cemetery on Friday, 10th January. He is survived by his widow and three sons, and to them deep sympathy is extended.

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Heart-leaved Poison Bush.

A.L.C. (Atherton)—

The specimen is the heart-leaved poison bush, *Gastrolobium grandiflorum*, very common in parts of Central and Northern Queensland. The poisonous principle is an alkaloid. This plant is one of the most serious poisonous plants we possess, and much more remains to be discovered concerning it, particularly at what stage of its growth it is most toxic. Most graziers believe that the plant is worst following a burn, but this is probably due to the fact that the sheep would eat more of the tender young shoots following a burn than they would of the somewhat dry and harsh adult leaves. Gastrolobium is one of the few plant poisons for which an antidote is known. The use of Condy's crystals (permanganate of potash) administered as a drench is said to be a sure and safe treatment, although, of course, it must be administered before the animal has gone too far. Dr. A. Herbert, in a valuable bulletin on the poisonous plants of Western Australia, quotes several cases of the successful use of the antidote in that State, and recommends as effective dose for sheep and pigs 10 grains (about as much as will comfortably lie on a sixpence), for horses 15 to 20 grains, and for cattle 30 to 50 grains. He states that the action of the antidote is more rapid when the stomach is in an acid condition. There are two or three methods of attaining this end. The use of lime juice or vinegar has been recommended, but, as you probably know, the experiments of Chestnut and Wilcox, Americans working on allied leguminous plants, show that aluminium sulphate is the most satisfactory substance. The genus *Gastrolobium* is very strongly developed in Western Australia, and about fifteen species or different sorts are known to be poisonous to stock in that State. We only have the one species in Queensland.

Poison Peach.

M.E.B. (Coolum)—

The specimen is the wild or poison peach, *Trema aspera*. This shrub is very common in coastal Queensland, and has a very bad reputation as a poisonous plant. At times it develops a prussic-acid-yielding glucoside, and if eaten in any quantity then trouble is likely to follow. This trouble is more likely to occur in weak and hungry stock than in paddock stock. The formation of the poisonous principle is very erratic, and what controls its formation we do not know. Personally, we have seen wild peach eaten to a very large extent in some places, and no trouble has ensued.

Plants from Brisbane Valley Identified.

D.C. (Toogoolawah)—

1. *Baccharis helimifolia* (groundsel bush).—This shrub has been suspected of poisoning stock at different times, but feeding tests carried out at Yeerongpilly with it some time ago gave negative results. After the animals had been feeding on it for about a fortnight they became very emaciated and constipated, but when put back on to normal fodder they soon recovered. The plant has little or no fodder value. We have seen stock eat it on the North Coast line, but more or less neglected by them usually.
2. *Physalis minima* (green gooseberry).—This is not known to be poisonous or harmful in any way.
3. *Phyllanthus maderaspatanus.*—A plant belonging to the family Euphorbiaceae for which we have not heard a common name. It is a fairly common weed in pastures in coastal Queensland. It has no poisonous properties.
4. *Rhynchosia minima.*—A legume very common throughout the coastal Queensland pastures and for some little distance inland. It is generally considered as quite a useful herb in the mixed pasture.

We do not consider any of these plants responsible for your trouble. If the losses are serious and still continuing, it might be best to have an examination of the paddocks.

Wild Mint.

R.P. (Grantham)—

The specimen represents wild mint or narrow-leaved sage, *Salvia reflexa,* a native of the United States now naturalised in parts of Queensland, where it has become a very serious weed pest. The plant has been proved to be poisonous by feeding tests. Most of the serious trouble seems to have been with travelling stock, ordinary paddock or resting stock not being affected, or at least to the same extent. A peculiar feature of poisoning by this plant is that sometimes no symptoms are noticed for a couple of days after ingestion. There is generally a twitching of the muscles, and death follows a few hours after the appearance of marked symptoms. A bulletin by the Poison Plants Committee of the Council for Scientific and Industrial Research advises that on post mortem all the organs were found engorged with blood, and a slight inflammation of the fourth stomach and bowels was also noticed.

Two Reputedly Poisonous Plants.

J.J. (Kingsthorpe, via Toowoomba)—

Of the two specimens, the flat-leaved one represents a species of *cotyledon* or *echeveria.* This plant is common in garden culture, but we have never known it to be eaten here before. However, the plant has a very bad reputation as a poisonous one, and if eaten by your pigs we think it is almost sure to cause trouble.

The longer, narrower, and somewhat triangular leaf is a species of *Mesembryanthemum,* or pigface. This likewise is supposed to be poisonous, causing stupor, but we think the other plant is more likely to be the cause of your trouble. In any case we would keep pigs away from both of the plants or dig them out.

Black Bean.

A.E.H. (Kulara, via Cairns)—

The specimens represent *Mucuna gigantea,* a vine widely spread through coastal Queensland and extending into New Guinea. It is sometimes known as black bean. We have never heard of the species being eaten, and most species of *Mucuna* are somewhat deleterious. Although we have had no experience with them, we should think it unwise to try them as food.

Bottle Tree.

E.A. (Toowoomba)—

The specimen forwarded with your letter of the 4th instant is *Sterculia discolor,* sometimes known as the scrub bottle tree. It is a native of Southern Queensland, and is mostly found in the drier scrubs. It grows to a large size and makes a handsome tree well worthy of cultivation. There are one or two in gardens about Brisbane, and we have seen it as a street tree at Grafton, in New South Wales. There is a very fine avenue of them in the main street of Augathella, Western Queensland. It should grow quite well at Toowoomba. It is usually propagated by seed. If you are unable to get seed, try cuttings. We have had no experience with the tree, but do not see why it should not strike from cuttings.

Sturt's Pea.

H.W. (Proston, via Murgon)—

Clianthus Dampieri, Sturt's pea, is not at all likely to become a pest if cultivated in the garden. We have never seen it run out anywhere in Queensland—in fact, a number of people seem to have difficulty in growing it. It is very abundant in some of the drier parts of Australia in its native habitat, as at Broken Hill and parts of South and Western Australia. We have never heard of it causing trouble to stock, and it is not known to possess any poisonous or harmful properties. We should think the chances are that the flower is self-fertilized, but on this point we have no definite knowledge.

Plants from the South-West Identified.

H.S. (St. George)—

1. *Tetragonia expansa* (New Zealand spinach).—A very common farm and pasture weed in parts of Queensland. The leaves are used as a substitute for ordinary spinach, hence the local name.
2. *Tribulus terrestris* (caltrops or goat head).—A very common pasture weed in Queensland. It produces a very troublesome burr.
3. *Eriochloa* sp.—The name "early spring grass" is sometimes given to species of *eriochloa*, but we do not know that the name is appropriate, as it is not earlier than many other native grasses. All species of *eriochloa* are excellent fodders and worthy of encouragement.
4. *Chloris truncata.*—The native chloris grasses, of which truncata is a species, are very valuable sheep fodders, producing a good, leafy bottom. They are among the first to respond to spring rains, and we have noticed this particularly with the present species.
5. *Cyperus* sp.—It looks like *Cyperus rotundus*, nut grass, but as there are no seed heads we cannot be sure.
6. *Sporobolus pallidus*, sometimes called fairy grass, but this name is applied to other grasses also with somewhat similar seed heads. It grows rapidly following rain, but is rather short lived.
7. *Hibiscus trionum.*—This is a very common weed over the warm temperate regions of the world. It is very common on the Downs and in parts of Central Queensland. We cannot say that we have seen stock eat it, at least to any extent.
8. *Eragrostis cilianensis* (stink grass).—This is a very common grass in Queensland. It mostly occurs as a farm weed. Generally it is left untouched by stock, owing to the peculiar odour given off by the leaves. The only cases where we have heard of stock eating it are where horses ploughing have taken to it rather readily, but under these conditions horses eat almost anything.
9. *Verbena officinalis.*—This is a very common weed in Queensland which is not eaten by stock so far as we know. It is not known to possess any harmful or poisonous properties.
10. *Dicanthium sericeum* (blue grass).—One of the best grasses of the Western Downs.
11. *Dactyloctenium radulans* (button grass).—This is an excellent fodder readily eaten by stock both in the green and dry state.
12. This does not look to us like a native plant, but we think is a shoot from a pomegranate, *Punica Granatum.*
13. *Capparis lasiantha.*—This is a very common climbing plant on the Darling Downs and parts of Western Queensland. The fruit is edible and sometimes called mulpup.
14. *Zygophyllum apiculatum* (twin-leaf or gall weed).—This plant is extraordinarily drought-resistant, and is often seen in great abundance in cleared brigalow and belah country. It has been accused of poisoning stock, but we have not seen stock eat it to any extent. We are doubtful if it possesses any harmful properties, as an allied species in Western Australia has some reputation as a fodder during times of drought.
15. *Brachycome microcarpa.*—A native daisy.
16. *Atriplex Muelleri.*—A saltbush.
17. *Rumex bidens.*—A dock.
18. *Evolvulus alsinoides.*
19. *Solanum esurale.*—Potato bush.

A Poisonous Plant *(Wedelia asperrima)*

R.W.B. (Hughenden)—

The specimen forwarded and suspected of causing losses of sheep has been determined as *Wedelia asperrima*, a very common plant in North-Western Queensland and parts of Northern Territory. It has been received on several occasions as a plant poisonous to sheep. Sheep apparently only eat it in the young stages. It has been reported to cause pneumonic symptoms, and as similar ones are found to be caused by a closely allied plant in Southern Queensland and Northern New South Wales this supposition seems to be justified.

Oakey District Plants Identified.

M.I.R. (Devon Park, Oakey)—

1. *Paspalum dilatatum.*—The common paspalum.
2. *Danthonia* sp.
3. *Dicanthium sericeum,* (blue grass).—One of the best known fodders in Queensland.
4. *Echinochloa colona* (wild millet).—This is very closely allied to such well-known cultivated crops as Japanese millet and white panicum. It is a very good fodder.
5. *Paspalidium globoideum* (shot grass or sago grass).—It is very palatable to and much eaten by stock.
6. *Sporobolus pallidus.*—A short-lived grass coming up after the summer rains, which seeds quickly and dies off. It provides a fair amount of bottom, and is one of a number of grasses which are commonly called fairy grass.
7. *Dicanthium sericeum.*—Same as No. 3.
8. *Eulalia fulva* (brown top).—It is very common in Queensland, and is widely distributed throughout this State and New South Wales. Its reputation as a fodder varies greatly with the different districts. The coarser forms are not of much fodder value, but the finer forms are very useful.
9. *Themeda australis* (kangaroo grass).
10. *Sporobolus elongatus* (rat's tail grass).
11. *Cyperus* sp.—A sedge.
12. *Sorghum leiocladum.*—A tall-growing native sorghum.
13. *Eriochloa* sp. (early spring grass).—This name is not particularly appropriate, as species of *Eriochloa* are not more responsive to early rains than any other native grass. They are all good fodders, however.
14. *Cymbopogon refractus* (barbed wire grass).
15. *Digitaria Brownei.*
16. *Eragrostis cilianensis* (stink grass) so called on account of glands on the leaf edge giving off a peculiar odour. It is generally left by stock, although it may be occasionally eaten by horses when ploughing.
17. *Aristida leptopoda* (a three-pronged spear grass).—From the point of view of fodder this is perhaps the best of the aristidas, the others being all fairly wiry.
18. *Tragus racemosus* (small burr grass).
19. *Chloris ventricosa.*—A native chloris or star grass which makes an excellent bottom fodder for sheep.
20. *Aristida leptopoda.*—Same as No. 17.
21. *Digitaria divaricatissima.*
22. *Eragrostis leptostachya* (paddock love grass).
23. *Enneapogon nigricans.*
24. *Sporobolus pallidus.*
25. *Chloris divaricata.*—See note to No. 19.
26. *Agropyron scabrum* (wheat grass).—It varies considerably in fodder value in different districts. Most of the common forms on the Downs are rather wiry and not eaten to any extent.

Ground Berry.

J.K. (Clifton)—

The specimen represents *Physalis subglabrata,* a native of the United States. It is a species of gooseberry or, as it is known in America, ground berry. If it gets into cultivation it is a serious pest. We have had it on several occasions in Queensland, but mostly just scattered here and there, once from Kingaroy and several times from the Downs about Warwick. Eradication is certainly difficult. Ploughing and hoeing and ordinary mechanical means only cause fresh plants to grow from each piece cut off, as you have found out. You tried covering them with straw, but we do not think this will be very effective, as the plants will either grow through, or, as soon as you lift it, they will spring up again. The only mechanical means would be to keep the green parts cut off so that the underground roots would gradually die out. This is all right in a small garden, but it is practically impossible under field conditions, except in a small patch. The best means would be a slow poison that would penetrate to the roots, and we have asked the Agricultural Chemist to advise you on this matter.

Paspalum Urvillei.

N.R.C. (Currumbin)—

The specimen represents paspalum urvillei, a tall-growing paspalum boomed some time ago as a fodder under the name of *Paspalum virgatum*. It has never taken on very readily, and seems to have gone completely out of favour. It sometimes grows quite well on poor country, but as far as our experience goes stock reject it unless driven to it by extreme hunger.

Two Fodder Shrubs.

W.S.C. (Roma)—

1. *Ehretia membranifolia*.—This is a very common tree or shrub in parts of Western Queensland, and it is generally regarded as a good fodder.
2. *Celastrus Cunninghamii*.—This is fairly common in Queensland, growing both on the coast and inland. In the Maranoa district it mostly grows as a shrub. It is generally resgarded as a good fodder, but we have not seen stock eat it.

These specimens are in full flower, and there is no doubt of determination. They are moderately common in parts, but we have not heard local names given to any of these plants.

Clover and Rye Grasses.

PROJECT CLUB, Garnant State School (via Rockhampton)—

Common Name.	*Botanical Name.*	*Country of Origin.*
Suckling Clover	*Trifolium minus*	Europe (widely spread).
Berseem Clover	*Trifolium alexandrinum*	It has never been found growing wild, but is supposed to have originated in Egypt or the near East.
Bokhara Clover	*Melilotus alba*	Probably Western Asia. Now widely spread over Europe, Northern Asia. It has been introduced into America, New Zealand, and Australia.
Perennial Red Clover	*Trifolium pratense*	Europe and Western Asia. Now so widely spread in cultivation, it is rather hard to say where it is truly a native and where introduced.
White Clover	*Trifolium repens*	Europe and Western Asia.
Cocksfoot Grass	*Dactylis glomerata*	Europe and Temperate Asia.
Italian Rye Grass	*Lolium multiflorum*	Southern Europe and Northern Africa (Mediterranean region).
Perennial Rye Grass	*Lolium perenne*	British Isles and Central Europe.
Wimmera Rye Grass	*Lolium subulatum*	A native of Southern Europe. It first attracted attention as a fodder in the Wimmera district, Victoria, hence local name.
Western District Rye Grass	*Lolium* sp.	Probably of cultivated origin.

Cape Cotton.

W.H. (Mount Samson, Dayboro' Line)—

The specimen represents Cape or balloon cotton, *Gomphocarpus fruticosus*, a native of South Africa, but now a common naturalised weed in Queensland. It is sometimes encouraged on a property when it first makes its appearance on account of its ornamental appearance. It can become a very serious pest, however, and eradication of the plants you have is recommended.

Candle Nut.

"SAP" (Townsville)—

The nut is the Candle Nut, *Aleurites moluccana,* a native of North Queensland, but also widely spread through New Guinea, parts of the Malay Archipelago, and islands of the Pacific. The nuts yield a valuable drying oil for which it is hoped to find a market in the future. We have known people to eat the nuts frequently, but sometimes they cause gastric trouble, with purging and vomiting, possibly from being eaten in a somewhat rancid state.

Grasses from Condamine Identified.

J.L.B. (Condamine)—

1. *Dicanthium* sp.—This looks like a form of blue grass, *Dicanthium sericeum.* These grasses are at present under review, and all of our material is in the hands of a specialist to classify.
2. *Dicanthium* sp.—The same remarks apply as to No. 1.
3. *Chloris ventricosa.*—A native chloris grass, which are amongst the best of the native grasses, especially in the brigalow and belah country. They give a good quantity of leafy bottom relished by sheep.
4. *Eleusine indica* (crowsfoot grass).—This grass mostly occurs in Queensland as a weed of cultivation, around cowyards, or anywhere the ground has been disturbed rather than in the ordinary pasture. It is fairly coarse, but is readily eaten by stock. Like young sorghum and other grasses it contains a prussic-acid-yielding glucoside, but there has been very little trouble from it in Queensland.
5. *Chloris ventricosa.*—Same as No. 3.
6. *Digitaria divaricatissima.*—A very common grass on the Downs country, and generally regarded as quite a good fodder.
7. *Bothriochloa intermedia* (sometimes called tall or Queensland blue grass).—It is generally regarded as a good fodder.
8. *Digitaria marginata* (summer grass).—This mostly occurs in Queensland as a weed of cultivation and in somewhat similar situations as *eleusine indica.* It is quite a good fodder.

We are very interested in your notes on the blue panic grass. We think it is quite a good grass in certain situations, particularly for small paddocks for grazing off. Mitchell grass should grow well with you if you can establish it, but the chief objection raised to Mitchell grass on small areas in the Western Downs is that its carrying capacity is not thought to be high enough. If sown, however, this would probably not hold, as it would grow much thicker than under ordinary conditions in the normal pasture.

Ulceration of the Skin of Pigs.

A dairy farmer writes—

"I have two pigs that have large sores on the skin; in one case the sore is as large as a saucer on the shoulder, and it seems to be spreading. It came on very suddenly, and there was no swelling as there is in the case of ordinary abscesses. Can you tell me what the disease is and how to control and treat it?"

This is a condition known as ulceration of the skin. It has been described by Departmental veterinary officers as ulcerative spirochaetosis of pigs and ulcerative granuloma of pigs. Mr. K. S. McIntosh, B.V.Sc., states that, as the name denotes, the disease is caused by a spirochaete or spiral-shaped germ which apparently gains entrance to the body through wounds or scratches of the skin or deeper structures. It is not uncommon to find the sockets of the teeth affected when the milk teeth are being shed, and it is frequently seen causing large abscesses following castration. Other organisms are also present, but are regarded as secondary invaders and not the primary cause. The condition is described fully by Mr. McIntosh in the "Queensland Agricultural Journal" for May, 1935, and is now available in leaflet form at the Animal Health Station, Department of Agriculture and Stock. The disease is generally, though not always, associated with dirty, unhygienic, and badly managed piggeries, and no doubt is encouraged by lice and other parasites. Treatment is not easy, but must be persevered in if results are to be obtained and the disease controlled or eradicated.

General Notes.

TUNG OIL GROWERS.

All growers of Tung Oil who will have seed nuts available for disposal during the present season are asked to forward, without delay, an estimate of their crop (weight of dried nuts) to the Under Secretary, Department of Agriculture and Stock, Brisbane.

An endeavour is being made to arrange for the milling of the crop, but unless a sufficient quantity is available, no finality can be reached; consequently, the importance of an early reply will therefore be realised.

No attempt should be made to include last year's seed, as it has been found unprofitable to treat year-old nuts. Growers should, therefore, thoroughly clean under their trees before new season's nuts commence to fall.

E. GRAHAM, Under Secretary.

Staff Changes and Appointments.

Mr. K. D. Hoffmann, Inspector under the Diseases in Plants Acts, and Agent under the Banana Industry Protection Act, has been transferred from Stanthorpe to Nambour.

The resignation of Mr. G. F. Young as Inspector under the Stock, Dairy, and Slaughtering Acts, Crow's Nest, has been accepted as from the 25th February, 1936, as tendered; Mr. F. H. D. Marshall, Inspector under the Stock, Dairy, and Slaughtering Acts at Oxley, has been transferred to Crow's Nest; and Mr. J. E. Ladewig has been appointed Inspector under the Slaughtering, Stock, and Dairy Acts at Oxley.

Constable T. R. Doyle, Mount Larcom, has been appointed an Inspector under the Slaughtering Acts, as from the 29th February, 1936.

Dr. F. H. S. Roberts, Entomologist, Department of Agriculture and Stock, has been appointed Entomologist and Parasitologist, Animal Health Station, Yeerongpilly.

Mr. L. H. Mansell, Bundaberg, has been appointed Agent of the Central Sugar Cane Prices Board for the purpose of making inquiries in regard to sales and leases of assigned lands during the absence on leave of Mr. A. E. Aitkin.

Mr. James Purcell, Toowoomba, Chairman of the Butter Board, has been appointed Chairman of the Dairy Products Stabilisation Board until 30th April, 1936.

The following honorary rangers under the Animals and Birds Acts have been appointed to supervise the protection of native animals and birds on the Cooby Creek Reserve, near Toowoomba, which was recently declared a sanctuary under the Acts:—Messrs. M. J. Barry, Health Inspector; H. J. Wrembeck, Councillor of Rosalie Shire; A. H. Hart; G. Haig; and W. H. Clark, Shire Overseer.

Messrs. P. F. A. Hardman, B.V.Sc., and M. R. Irving, B.V.Sc., have been appointed Government Veterinary Surgeons, Department of Agriculture and Stock, Brisbane.

The following members of the Committee of the Queensland Cane Growers' Council have been appointed honorary rangers under the Animals and Birds Acts:—Messrs. A. W. Browne (Edmonton), J. Mann (Edmonton), J. J. Mason (Yorkey's Knob road, Cairns), J. Moore (Double Island road, Cairns), W. C. Griffin (Gordonvale), T. H. Sheppards (Gordonvale), R. M. Bennett (Aloomba), J. B. Anderson (Edmonton), S. H. Warner (Cairns), T. Boylan (Babinda), H. J. Thomas (Bartle Frere), and J. C. McPaul (Bellenden-Ker). Mr. N. G. Scott, Ingham, has also been appointed an honorary ranger under the abovementioned Acts.

Messrs. W. G. Merrill (Finch Hatton) and F. W. Valentine (Sybil Creek, via Mackay) have been appointed canegrowers' representatives on the Cattle Creek Local Sugar Cane Prices Board, and Messrs. P. E. Neilsen (Septimus, Mirani) and T. F. Ross (Oakenden, Eton) have been appointed canegrowers' representatives on the North Eton Local Sugar Cane Prices Board.

Messrs. B. Henry (Tully), N. Reynolds (El Arish), M. Scanlan (Tully), P. Byrne (Tully), and P. Baxter (South Johnstone), have been appointed honorary rangers under the Animals and Birds Acts.

The following have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act:—Messrs. A. D. Moore (Dalby), G. Hussey (Goomburra Homestead, Goomburra), F. Windolf (care of J. Maddox, Cunningham Gap road), R. A. Clelland (Douglas street, Greenslopes), W. C. Clelland (162 Edward street, City), O. M. Higginbottom (Warren street, Valley), E. Buzzacott (Wilton avenue, Yeronga), H. Wetherell (Victoria avenue, Chelmer), and Dr. W. H. Bryan (Sandgate road, Nundah). In addition, Messrs. R. W. Lahey (Feez street, Yeronga), Dr. E. O. Marks (Wickham terrace, Brisbane), M. P. M. Campbell (Wilston), C. T. White (Government Botanist), J. Nebe, Fifth avenue, Coorparoo), and J. E. Young (Graceville), have been appointed honorary rangers under the Animals and Birds Acts. All of the abovenamed, with the exception of Messrs. Moore, Hussey, and Windolf, are members of the Council of the National Parks Association of Queensland.

Compulsory Branding of Pigs.

Attention has been drawn recently to neglect on the part of many farmers who fail to correctly identify their pigs before sale or disposal, remarked the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) when discussing these matters recently.

Mr. Bulcock has issued instructions for the strict enforcement of the Regulations under the Pig Industry Act which have a special bearing on pig branding, and reports in all cases where the regulations are being deliberately contravened.

This subject came up for discussion at a meeting of the Queensland Pig Industry Council held at the Department of Agriculture and Stock prior to the Christmas holidays, when a motion was referred to the Minister asking that special attention be given to the compulsory branding of all pigs offered for sale, irrespective of age, and whether consigned direct to factories, sold "over the scales" at country sidings, sold to dealers, or submitted for public auction in country or city saleyards.

At that meeting it was remarked by Mr. Shelton that at no previous stage had this matter been emphasised so much as during the past two years, the result being that the majority of pork and bacon pigs slaughtered at Queensland factories to-day are identified, the method of branding being more acceptable, and the losses from improper fire branding being fewer than they were even twelve months ago. However, there are still a large number of farmers and dealers (in particular) who either do not properly identify their pigs before sale or despatch, or who depend upon somebody else to do the work they are legally expected to do themselves. Many farmers fail to identify the pigs they offer for sale in store condition, or, as weaners, pigs which are purchased by other farmers or by dealers who, in due course, market them, often having little or no record of previous ownership—information which is absolutely necessary in investigation into disease. Farmers are, therefore, losing money through neglect on the part of those who fail to brand their pigs before sale.

The Department of Agriculture and Stock is at all times willing to supply information free of charge that will enable the farmer to comply with the Regulations, and thus encourage the factories to pay a better price for a necessary supply of suitable quality pigs.

The Departmental pamphlet "Identification of Pigs" is free of cost on application, and deals very fully with the various systems of branding, and has special reference to those Regulations under the Pig Industry Act which govern this portion of the farm routine.

It is worthy of note, also, that auctioneers, agents, and dealers who offer pigs for sale or who purchase stock from farmers with that object in view have a special responsibility, because the regulations specify that all such transactions shall be properly recorded, the record to contain the identification mark, the age and description of all pigs sold, and such other information as may be required by an inspector in the course of his duties.

It is of particular interest to note that one inspector reported recently that at the principal pig sale in his district every pig offered for sale carried an identification mark. "This," said Mr. Bulcock, "shows that it can be done if all work together co-operatively."

Citrus Levy Regulations.

A Regulation under the Fruit Marketing Organisation Acts provides for the extension of the Citrus Levy Regulations for a further period of twelve months as from the 1st March, 1936.

Canadian Wonder Beans—Caution Necessary.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) desires to issue a warning to purchasers and vendors of Canadian Wonder French beans that, in their own interests, they should exercise great caution in dealing in this variety. As a minimum germination of 75 per cent. is prescribed under the Pure Seeds Regulations, purchasers should insist on this standard, and should secure with the purchase an invoice warranty as to quality.

Mr. Bulcock pointed out that Queensland is entirely dependent upon outside sources of supply for French bean seed for sowing, and during last year, owing to the poor quality of the commodity, it was found necessary to introduce effective methods of control involving the examination of each bag of Canadian Wonder beans received in Brisbane from overseas or on offer for sale by local seed vendors. Results of these examinations indicated that on account of faulty germination 20 per cent. of the bags presented for admission had either to be destroyed or returned to the country of origin. In addition, a large proportion of the samples obtained from the stocks on offer were found to be low in germination value, resulting in their withdrawal from sale. In all, 328 bags were involved. The examination of samples during the month of January in the present year resulted in the condemnation of approximately 50 per cent. of offerings, and in one instance no germination was recorded.

Mr. Bulcock pointed out that insistence on a minimum germination of 75 per cent. could not be viewed as a harsh measure, in that certain offerings have shown a germination of 90 per cent. in three days. The minimum germination standard is prescribed in the interests of growers, as it is obvious that when the germination falls below 75 per cent. only a corresponding proportion of the area planted would bear productive plants.

The Minister stated that the sale of beans that do not germinate up to standard is viewed very seriously by the Department, and provision is made in the Pure Seeds Regulations for a penalty not exceeding £20 for the first offence and not exceeding £50 for every subsequent offence, in cases where the sale of seeds does not comply with the prescribed standards.

In order to more easily detect the faulty beans the Seed Testing Station carries out all tests on Canadian Wonder beans free of charge, and particulars incidental to the submission of samples can be had on application to the Department of Agriculture and Stock, Brisbane.

Importation of Potatoes and Onions.

The Regulations under the Diseases in Plants Acts with reference to the importation into Queensland of potatoes and onions have been amended, and now provide that no potatoes or onions shall be imported into Queensland unless they are packed in new bags or cases, or in clean cases that have not previously been used for holding potatoes, and are accompanied by a certificate issued by a Plants Inspector of the Department of Agriculture in the exporting State setting out that such potatoes or onions are apparently free from any disease defined as such by the Queensland Diseases in Plants Acts affecting potatoes or onions. Further, in the case of potatoes and onions imported into Queensland in a bag or other package, the grower's or exporter's name and address must be in letters or figures not less than one and one-half (1½) inches in length.

Branding of Bags of Seed Potatoes.

A new Regulation has been issued under the Fruit and Vegetables Act providing that, in the case of any potatoes contained in a bag or package and intended for seed purposes, the packer shall, before such bag or package is taken from the premises where it has been packed and before it is sold or offered for sale, effectively obliterate all previous markings (if any), and mark or cause to be marked legibly and durably on the outside, in letters not less than one and one-half (1½) inches in length, the name and address of the packer and the name of the variety.

The Slaughtering Act.

In 1904 a Proclamation was issued under "*The Slaughtering Act of* 1898" declaring the provisions of the Act to be in operation in all the cities, towns, and shires of the State. This Proclamation has been rescinded and a new Proclamation issued reapplying the Act to be in force in the districts including all cities, towns, and shires comprising the State of Queensland.

Rural Topics.

Tamworth Pigs from New Zealand.

Three Tamworth pigs—a boar and two sows of unrelated Canadian strains—were delivered recently from New Zealand to the order of the Wide Bay Stud Piggery, Gympie. Considerable progress has been made in the New Zealand pig industry in recent years. The Tamworth breed has been found most suitable to the climatic conditions and trade requirements, and special attention has been given to the breeding of a type that will reproduce itself faithfully and prove prepotent and prolific.

Classification of Stock Foods.

Foods are classed according to their composition, and the substances which are utilised in the animal body may be roughly classified as:—(1) Starchy and fatty materials, which produce heat and fat in the body, and are known as carbohydrates; (2) substances containing a large amount of nitrogen, commonly called proteins, and essential to the muscular growth and development of the body; and (3) mineral salts, which are necessary to body changes and the building up in the growing animal of the harder tissues of the body, such as bone.

All foods contain a combination of these materials to a greater or less extent, but some are richer in one or more classes than others. Thus, most root crops, such as potatoes, sweet potatoes, turnips, arrowroot, artichokes, grains, such as maize, wheat, &c., and vegetables and fruit are very rich in starch and sugar, while linseed meals, oil cakes, &c., and unseparated milk contain a large percentage of oil. Peas, beans, lucerne, clovers, milk, meat-meal, flesh, and other animal products have a big percentage of protein. Mineral matters are present to a great extent in milk, oats, mill offal, lucerne, peas, and beans.—"A. and P. Notes," New South Wales Department of Agriculture.

Foundation of the Australian Wool Industry.

Captain John Macarthur's part in the history of Australian woolgrowing is told by himself in a statement which he laid before Lord Hobart, then Secretary of State, on 26th July, 1803, when on a visit to England. His object in going to England was twofold. He sought by an appeal to His Majesty's Ministers a diversion in his own favour of the primitive Land Law of the colony. He also wished to interest British capitalists in the formation of a pastoral company to take up land in New South Wales. Referring to samples of wool brought by him from New South Wales, he said that it had excited the particular attention of merchants and leading English manufacturers. He had found the climate of New South Wales peculiarly adapted to the increase of fine-woolled sheep, and that from the unlimited extent of luxuriant pastures with which the country abounded millions of those valuable animals could be raised in a few years at small expense. The sheep producing this fine wool was of the Spanish kind, sent originally from Holland to the Cape of Good Hope, and taken from thence to Port Jackson.

When Captain Macarthur left Port Jackson in 1801 the heaviest fleece that had been shorn weighed only 3½ lb. In 1802, however, fleeces of his sheep were increased to 5 lb. each (in the grease), and the wool was finer and softer than that of the preceding year. The fleece of one of the sheep originally imported from the Cape of Good Hope was valued in London at 4s. 6d. a lb., and a fleece of the same kind bred in New South Wales was estimated at 6s. a lb. Being once in possession of this valuable breed and having ascertained that they improve in the climate, Captain Macarthur became anxious to extend them as much as possible. He, therefore, crossed all the mixed-bred ewes of which his flocks were composed with Spanish rams. The lambs produced by this cross were much improved, but when they were again crossed the change far exceeded his most sanguine expectations. In four crosses he believed that no distinction would be perceptible between the pure and the mixed breed. As a proof of the extraordinary and rapid improvement of his flocks Captain Macarthur exhibited the fleece of a coarse-woolled ewe that had been valued at 9d. a lb. and the fleece of her lamb begotten by a Spanish ram, which was allowed to be worth 3s. a lb. In 1803 Captain Macarthur had about 4,000 sheep, among which there were no rams but those of the Spanish breed.

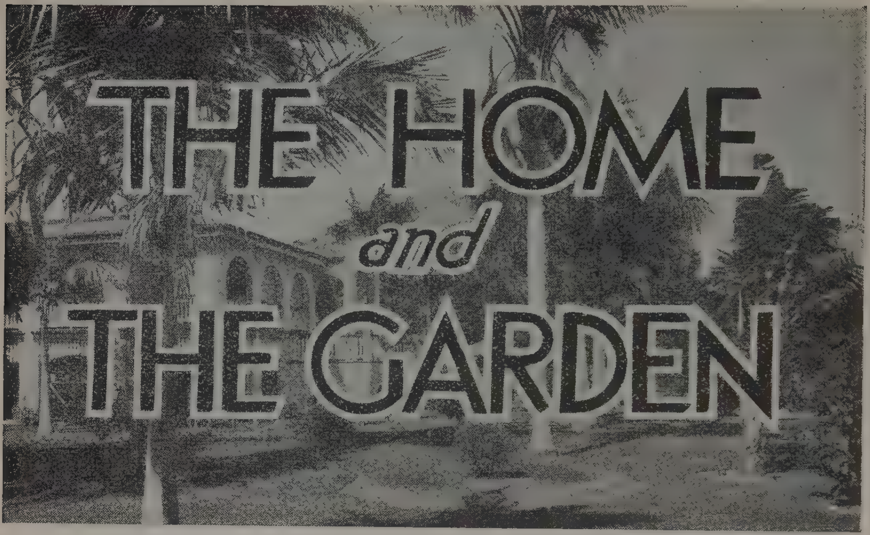
Crop Rotation.

Thus ''Himi,'' in the current ''New Zealand Farmer'':—''In the age-old practices of agriculture in the old country succeeding years have always revealed new problems. It was not long, for instance, before it was discovered that the growing of cereal crops year after year created a cumulative breeding ground for all kinds of weeds, until a culminating point was reached and cropping operations had to be abandoned. Then arose the need for rotations as an aid to the destruction of weeds. This was the origin of one of the oldest rotations practised—wheat, beans, fallow—a three years' rotation in which one year was occupied in getting rid of the accumulated weeds encouraged by the two ''cash'' crops. In good farming districts in Great Britain and on the Continent the rotation of crops was universally practised for generations. The systems employed were imported to New Zealand, and, under the differing conditions, not always with satisfactory results. But vast changes have come about as a result of the gospel of all-grass farming for one of the greatest of New Zealand's primary industries—dairying. There are now many farms that have not grazed a horse or seen a furrow turned for years. The writer knows one farmer who meanders round his paddocks kicking the cow-packs away and who, when the due seasons arrive, engages a neighbour who possesses a distributor to ''sprinkle'' the necessary topdressing. Others use a spade, a shovel or other implement for scattering the cow-dung. On these places grass harrowing never occurs. (And, after all, the only real service that the chain harrows appear to perform is to scatter the packs and other surface accumulations.) It must not be thought that the foregoing are the common forms of farming in this Dominion. They are not. These cases are merely mentioned to emphasise the expansion of the ''all grass'' cult, and to register a question mark as to the problems that this system of dairy farming will create for the future. A couple of years ago, when a more or less mysterious ailment was prevalent among cattle, one prominent veterinarian attributed it to ''grass sickness.'' The situation is worth watchful attention. Many farmers, of course, still firmly adhere to the growing of roots or other crops, even if only as an insurance against poor seasons for good grass.

When to Water your Horse.

A horse requires from 6 to 8 gallons of water a day under ordinary conditions. When grazing on green pasture or when fed succulent foods such as carrots and other roots with chaff, less will be required. Water consumption will be increased when the weather is very hot, when the horse is hard at work and perspires freely, when the food is very dry, and in the case of mares in foal or with foal at foot. The stomach of the horse is small, and cannot contain a full feed and several gallons of water at the same time. It is important, therefore, that water should be given before feeding, or not for one or two hours after feeding. If water be given immediately after feeding a certain amount of undigested food will be flushed out of the stomach and carried into the intestinal tract, where it may cause colic and other digestive troubles. It also weakens the digestive juices, and thereby retards digestion of food in the stomach. If the water contains a large amount of sediment it is likely to cause a mechanical irritation of the mucous membrane of the stomach and intestine. This finally results in the form of colic known as sand colic. Water may be given in small quantities within an hour of feeding if desired, but when the practice of watering before feeding is made a regular habit water will not be consumed in sufficient quantity after feeding to produce any ill-effects.

After a long journey the horse may be watered a mile or so before the journey's end, and take the horse in slowly afterwards. This prevents chills and colic due to taking in large quantities of water when in an exhausted state. If this is not possible it is advisable to give the horse a little water before removing the harness, then turn him into a clean yard, where he can have a roll before stabling. Give the body, thighs, and arms a brisk rub down with a coarse cloth or a handful of straw, then allow another drink before feeding. After prolonged exertion or fast work the animal's system is depleted of fluid. He will not eat sufficiently until his thirst has been satisfied, therefore water should come first, and while the animal is still warm is the best time to give it. Horses kept in the stable should be allowed water at least three times a day. When running in the open or if kept in stable yards, it is advisable to have a supply of clean water accessible at all times. When given free access to water animals will not take more than is necessary, and the appetite is usually a very safe guide to the requirement of the system.



OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THUMB OR FINGER SUCKING.

Some Suggestions for Prevention.

FIRST of all, how does the habit start? Baby associates anything which touches his mouth with the art of sucking. All's fish that comes to that net. Wandering fingers find the mouth, and almost at once association sets up a habit, as a result of which the fingers or thumbs go automatically to the mouth.

Tuck baby's hands up in his shawl, so that he will not find and exploit this trick in his drowsy or going-to-sleep times. You need not be afraid of hampering him too much if you bring the shawl round over the shoulders and tuck it back in under the arms. There are many ways of preventing the tiny baby from getting into the habit whilst still allowing freedom of movement.

Try making a splint to fit over baby's elbow. This is easily done by procuring a piece of good cardboard about 4 inches wide and long enough to fit comfortably round the arm at the elbow. Score it with a knife to enable it to bend round the arm, and then cover with old linen. Have two tapes on each end long enough to fasten the splint. Sew a small loop of tape to the top edge to allow the splint to be fastened with a small safety pin to the garment the child is wearing. This prevents the splint from slipping once it is applied. This has been proved most effective, and has the advantage of allowing baby free use of his hands and arms, except that he cannot bend his elbow joint.

As baby grows, however, it is essential for him to have his hands free, because his sense of touch is his first and most important means of exploring his world. His own hands and toes, his bed, clothes, toys—everything should come into contact with his hands; not to stay at first, but every different touch teaches him something. Here you see how baby's field of activity and interest is restricted if he is abnormally occupied with his mouth. Is it fair to permit him to cultivate a habit which almost entirely shuts him off from the joys experienced by every child as he explores each new object with his hands?

However, at this very time baby may develop the habit from boredom, if he has not enough normal, natural, healthy stimulation from his immediate environment.

Toys.

It is quite allowable to have a pretty toy, perhaps with a tinkling bell, where it is just within reach of baby's exploring hands. Take care that it is not too low or too near the eyes. Never force it on his attention. Have it there for him to discover, and do with as he can and will. At first he will lie and look at the slightly moving object, then a moving hand touches it, a sensation and a sound result. Gradually, very gradually, it comes under his control, and meanwhile no boredom, but still no over-stimulation. Never jingle the plaything or bounce it up and down. It is a baby's toy, for him to use, not yours.

Mothering.

Sometimes thumb sucking starts when a baby is weaned, or even later, when another baby comes. It is in this instance probably due to loneliness and want of comfort and love or an unconscious longing to remain the baby. This may be prevented or cured by extra mothering, wise, loving management, healthy, absorbing occupation, and the companionship of other children. Life should be altogether too interesting and happy an affair for the normal baby to want to suck his thumb.

Once the habit is firmly established much patience and perseverance will be needed and much supervision to cure it. One "do or die" fight is infinitely better than a prolonged half-hearted struggle, in which the mother loses influence and the habit gains strength, whilst nerves and tempers are frayed all round.

Gloves, splints, and pinning the hands down may all be tried in dealing with the young baby, and any of these methods, combined with an overhauling of daily routine and management, usually puts things right quite quickly. For the older child more subtle treatment is necessary, as we have indicated. Gloves and finger stalls and bitter aloes may effect a cure in mild cases, but often they are simply disregarded with the most utter unconcern. The aim is to help the child forget the bad habit. If he is nagged at and scolded about it, it is only the more firmly fixed in his mind. Let him do things and feel things, and rampage generally in a safe place. As he learns to do more for himself and others, he tends to become so happy and engrossed that he does not seek the consolation of thumb sucking, which he associates unconsciously with the warmth and comfort of breast feeding and nursing times. The comfort which was normal then if prolonged beyond its natural limits tends to dwarf the child's growth mentally, emotionally, and physically.

IN THE FARM KITCHEN.

PEACHES.

Baked Peaches.

Take 6 slipstone peaches, sugar, butter, lemon juice, nutmeg.

Peel, cut in half, and remove the stones from the peaches. Place in a shallow fireproof dish. Fill each cavity with one teaspoonful of sugar, one half teaspoonful butter, a few drops of lemon juice, and a grating of nutmeg. Cook in a hot oven for twenty minutes and serve on circular pieces of buttered toast with cream.

Peaches au Gratin.

Take 1 jar peaches, breadcrumbs, butter, sugar, lemon juice.

Choose a flat fireproof dish, butter it well, arrange halves of peaches on it, round sides upwards, and fill up the spaces with breadcrumbs. Mix with the syrup from the peaches a squeeze of lemon juice and a little sugar. Pour over the peaches and cover them with breadcrumbs. Place small pieces of butter all over the top. Put the dish in a quick oven and brown nicely. Serve with cream or custard.

Peach Foam.

Take 4 ripe peaches, ½ cupful fine sugar, 1 egg-white.

Skin and cut the peaches into quarters, put them into a basin and add the sugar. Beat them together, add the egg-white, and go on beating till a perfectly smooth cream. Put into custard glasses and top with whipped cream. Place a glace cherry on each and serve very cold.

Peach Meringues.

Take 4 large slipstone peaches, 8 shortbread biscuits, 1 egg-white, jam, 1 tablespoonful castor sugar.

Peel the peaches, cut in half, and remove the stones. Cook in a small quantity of water with sugar to taste. Drain the peaches from the syrup and place one on each biscuit cup side upwards. Whisk the egg-white to a stiff froth, then fold in the castor sugar. Put the meringue into an icing bag with a rose or shell tube fixed in the bottom of it, and force it out to form a border all round each peach. Put in a cool oven to set and lightly brown the meringue, and when cold serve with a little jam on top of each peach.

Peach Jam.

To every 1 lb. stoned fruit allow ¾ lb. sugar.

Peel peaches and cut into slices, cover with 2 or 3 lb. of the sugar, and leave all night. Next day boil with a little water for half an hour or until the peaches are tender. Add the remainder of the sugar heated in the oven. The sugar should be quite hot so that it does not stop boiling. Boil from one and a-half to two hours briskly. The syrup should be rather thick when done. Use yellow peaches for making jam.

Peach Milk Mould.

Take 1 large tin sliced peaches, 2 oz. castor sugar, juice ½ lemon, ¾ oz. gelatine, ¾ gill water, ½ pint milk cream.

Turn the peaches into a basin, keeping back a few slices for decorating them, add the castor sugar and strained lemon juice and stir till the sugar is dissolved. Melt the gelatine in a saucepan with the water and strain into the peaches. Stir in the milk, leave the mixture till it begins to set, then turn it into a mould that has been rinsed out with cold water. When set turn out and decorate with whipped cream, sweetened and flavoured to taste, and a few sliced peaches.

Peach Betty.

Take 3 cupfuls sliced fresh peaches, 3 cupfuls coarse breadcrumbs, ½ cupful melted butter, sugar, grated orange-peel, nutmeg, cream.

Melt the butter and add to the breadcrumbs. Mix with a fork until well blended. Slice the peaches thinly. Put a layer of buttered crumbs in a greased pudding dish, cover with a layer of peaches, sprinkle with sugar and a grating of orange-peel. Continue alternate layers until crumbs and peaches are used. Cover dish and bake one hour. Remove cover the last half-hour to brown crumbs. Serve hot with sweetened cream flavoured with nutmeg.

Peach Batter Pudding.

Take 3 ripe peaches, ¼ cup sugar, 1 cupful flour, ½ teaspoonful salt, 1 cupful milk, 2 eggs.

Mix in a basin the flour, sugar, salt, and well-beaten eggs. Add gradually the milk and beat until the batter is smooth. Pare and slice the peaches very thinly, add to the batter and turn into a buttered piedish and bake very slowly for one hour in a moderate oven. Serve at once.

Empress Peaches.

Take 4 oz. rice, 4 ripe peaches, 2 oz. castor sugar, 4 tablespoonfuls red currant jelly, 1½ pints milk, vanilla.

Cook the rice in the milk in a double boiler with the sugar till the rice is soft and the milk has been absorbed, then add flavouring to taste. Peel and halve the peaches and place the fruit on a baking tin. Cook for a few minutes in the oven. Heap the rice on a hot dish and arrange the cooked peaches on top. Put the red currant jelly in the baking tin, and when it is dissolved pour over the peaches. This sweet can be served either hot or cold.

Peach and Passion Fruit Jam.

Take 1¼ lb. peaches, ½ dozen passion fruit, some lemon juice, 1 lb. sugar.

Peel peaches and cut into slices. Cover with half of the sugar and leave till next day. Boil till tender, then add remainder of sugar, lemon juice, and the passion fruit with some of the seeds strained out. Boil one and a-half to two hours or until it sets.

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Mango Chutney.

Materials—To each 1 lb. of mango pulp—½ lb. cooking apples; 1 pint vinegar; ¼ lb. seedless raisins; ½ lb. brown sugar; 2 oz. garlic; 2 oz. mustard seed; 2 oz. salt; 1 oz. ground ginger; ½ oz. cayenne.

Utensils—Knife; preserving-pan; wooden spoon; bottles; muslin bag.

Method—Peel and slice perfectly firm, ripe mangoes; they must be neither green nor over-ripe. Put them into a preserving-pan; add vinegar, apples, seedless raisins, brown sugar, garlic, mustard seed (tied in a muslin bag), salt, cayenne, and ground ginger. Boil slowly until the fruit is tender; remove mustard seed. Bottle and cover.

Papaw Chutney.

Materials—1 large pawpaw; ¼ lb. seedless raisins; 1 dessertspoonful sugar; 1 level teaspoonful salt; 6 peppercorns; blade mace; 6 cloves; 2 bay leaves; 1½ pints white vinegar.

Utensils—Saucepan; knife; muslin bag; jars.

Method—Peel pawpaw; cut it into small squares. Cut raisins into two. Put fruit into saucepan; add peppercorns, mace, cloves, bay-leaves, all tied in muslin bag. Add sugar and salt; cover with white vinegar. Boil till fruit is tender; remove muslin bag. Bottle; cover down air-tight. Stand in sun to clear.

Tomato Chutney.

Materials—2 lb. green tomatoes; ¾ lb. onions; 6 peppercorns; 1 blade mace; 3 bay leaves; 1 oz. whole ginger; 6 chillies; ½ tea-spoonful salt; 1 dessertspoonful sugar; 1½ pints of vinegar.

Utensils—Cloth; preserving pan; knife; jars; wooden spoon; muslin bag; string.

Method—Wipe tomatoes; cut into circles. Peel and cut up onions. Put onions and tomatoes into a preserving pan; add sugar and salt. Cover well with vinegar. Add peppercorns, whole ginger, mace, and bay leaves, all tied up in a muslin bag. Add chillies cut into three lengthways. Boil gently for 1½ hours, stirring occasionally. Bottle; cover down air-tight. Stand in sun for ½ an hour.

Tomato Sauce.

Materials—6 lb. tomatoes; ½ lb. apples; ½ lb. onions; ½ lb. sugar; ¼ lb. salt; ½ oz. garlic; ½ oz. allspice; ½ oz. peppercorns; 2 teaspoonfuls chillies; 2 teaspoonfuls crushed mace; 2 teaspoonfuls cloves; 2 teaspoonfuls curry powder; 1 pint vinegar.

Utensils—Cloth; knife; preserving pan; sieve; bottles.

Method—Wipe tomatoes and apples; peel onions. Put sliced tomatoes, apples, onions, and chillies into a preserving pan. Add sugar, salt, garlic, allspice, mace, cloves, peppercorns, curry powder, and vinegar. Boil for 3 hours. Strain and bottle.

Quince Jam.

Materials—Quinces; 1 cup of sugar to 1 cup of pulp; 1 lemon to 4 cups of pulp.

Utensils—Bowl; knife; cloth; preserving pan; cup; wooden spoon; plate; jars.

Method—Wash, pare, and core quinces. Cut into convenient pieces; put fruit into a preserving-pan. Add sufficient water to cover bottom of pan. Boil till the fruit is quite tender; add sugar and lemon juice. Boil till a small quantity jellies on a cold plate. Bottle; seal; cover down.

Quince Jelly.

Materials—Quinces; water; 1 lb. sugar to each pint of fruit juice.

Utensils—2 bowls; cloth; knife; preserving-pan; wooden spoon; flannel strainer; cup; jars.

Method—Wash quinces; wipe carefully; cut them into pieces. Put pieces into preserving-pan, being careful to add the seeds and milky-looking jelly round them. Cover with cold rainwater. Boil till the fruit is soft. Strain through coarse flannel into a basin. Measure liquid into a second basin. Add 1 cup of sugar to 1 cup of fruit juice; stir till sugar is melted. Allow to boil till a drop from a spoon sets on a cool plate; it may take 1 hour. Bottle while hot; cover down airtight.

Note.—The peel and seeds of quinces that have been used for quince jam make excellent jelly.

Rosella Jam.

Materials—Rosellas; 1 cup of sugar to each cup of pulp.

Utensils—Saucepan; knife; wooden skewer or blunt stick; cheese cloth strainer; preserving pan; wooden spoon; cup; jars.

Method—Cut off stalks; with a blunt stick push seeds out of the husks. Put stalks and half of seeds into a saucepan; cover them with water. Boil for 1 hour; strain through cheese cloth into a preserving-pan. Add the rosella husks; boil for 20 minutes. Measure; add 1 cup of sugar for each cup of pulp. Boil rapidly for 20 minutes, stirring continually. Bottle and seal.

Pumpkin Jam.

Materials—For each pound of pumpkin, take juice of one and rind of half a lemon; ¾ lb. of sugar; 1 teaspoonful ground ginger; 2 tablespoonfuls water.

Utensils—Knife; bowl; squeezer; preserving pan; wooden spoon; teaspoon; jars.

Method—Peel pumpkin; remove seeds. Cut the pulp into thin slices. Put slices into a bowl in layers; sprinkle each layer with lemon juice and sugar. Allow to stand for at least 12 hours. Pour contents of bowl into a preserving pan. Add water, grated rind of lemons, ground ginger, and remainder of sugar. Cook slowly till a small quantity jellies on a cool plate. Bottle; seal; cover down.

Peanut Toffee.

Materials—½ lb. sugar; ¼ teaspoonful cream of tartar; ½ cup water; 3 drops essence of lemon; 2 oz. peanuts.

Utensils—Saucepan; wooden spoon; cup.

Method—Put sugar, cream of tartar, and water into a saucepan. Boil to the crack degree (300 degrees F.). Grease a plate; cover with shelled and blanched peanuts. Flavour the boiled sugar; pour over nuts; when cool cut into squares.

Orchard Notes for April.

THE COASTAL DISTRICTS.

IN the Orchard Notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known as blue mould—a rotting of the fruit caused by a mould fungus—and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus-growers that it is necessary to again refer to it.

In the first place, growers must clearly understood that blue mould cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing blue mould can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury. The cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and blue mould follows in due course.

The remedy for blue mould is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of blue mould or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For oversea and interstate markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to export, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, for from now until the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, firstly, to retain moisture in the soil, and, secondly, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly-cleared land time to sweeten before planting.

Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth, and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of Bordeaux mixture, a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in—every effort should be made to bring the seed-bed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

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HOLDING UP THEIR MILK.

The power of a cow to retain her milk at will has never been satisfactorily explained. This power can be exerted instantaneously, and as long as the cow cares to exert her will in this direction the very best milker will not get a drop from her. The retention of the milk is not affected by the closing of the sphincter at the end of the teat—the cow seems to have little or no power over that part.

Holding up the milk is often the result of some irritation, and may be entirely the fault of the milker. Some cows are extremely sensitive, and a strange milker, even although a good one, will often cause them to withhold their milk for the time being. Very sore teats are a common cause, and occasionally the result is a bad quarter. Some heifers, under careless management, will hold up their milk day after day until the habit becomes confirmed, and in some cases it would seem to be hereditary.

There is a good deal of controversy on which side a cow should be milked; but in point of fact there is no correct side. It is all a matter of custom. If milking is done by hand it should always be done from the same side, but it does not matter whether it is right or left.—"Farmers' Gazette" (Ireland).

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1936 AND 1935, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Jan.	No. of Years' Records.	Jan., 1936.	Jan., 1935.
North Coast.	In.		In.	In.
Atherton	12·10	35	8·35	5·04
Cairns	16·70	54	16·76	5·58
Cardwell	17·02	64	10·69	2·36
Cooktown	14·51	60	10·01	10·82
Herberton	9·72	50	7·20	6·34
Ingham	15·77	44	10·65	3·61
Innisfail	20·44	55	10·53	7·10
Mossman Mill	18·19	23	12·11	18·97
Townsville	11·03	65	7·66	2·76
Central Coast.				
Ayr	10·98	49	10·75	0·93
Bowen	10·03	65	8·15	2·37
Charters Towers	5·46	54	2·39	3·02
Mackay	14·18	65	8·78	4·34
Proserpine	15·74	33	18·81	7·04
St. Lawrence	9·28	65	10·14	5·58
South Coast.				
Biggenden	5·20	37	4·92	3·15
Bundaberg	8·71	53	4·77	2·97
Brisbane	6·44	85	5·73	5·75
Caboolture	7·62	49	5·12	5·96
Childers	7·45	41	4·48	4·81
Crohamhurst	12·41	43	6·01	7·45
Esk	5·72	49	6·44	6·18
Gayndah	4·59	65	5·78	2·24
Gympie	6·62	66	6·74	3·74
Kilkivan	5·53	57	6·14	4·44
Maryborough	7·17	65	2·86	4·66
Nambour	9·68	40	7·03	6·67
Nanango	4·66	54	3·05	5·78
Rockhampton	7·68	65	5·98	4·11
Woodford	7·81	49	5·76	5·23
Central Highlands.	In.		In.	In.
Clermont	5·11	65	4·88	2·40
Gindie	3·68	37	4·78	2·04
Springsure	4·21	67	5·43	4·49
Darling Downs.				
Dalby	3·31	66	3·25	7·02
Emu Vale	3·19	40	4·47	2·67
Hermitage	3·22	30	..	1·99
Jimbour	3·50	48	2·29	3·84
Miles	3·66	51	1·61	5·23
Stanthorpe	3·59	63	2·88	4·00
Toowoomba	5.05	64	4·24	3·34
Warwick	3·55	71	4·44	2·50
Maranoa.				
Roma	3·09	62	2·18	2·76
State Farms, &c.				
Bungeworgorai	1·82	22	..	2·76
Gatton College	4·29	37	..	3·73
Kairi	9·53	22	3·82	2·42
Mackay Sugar Experiment Station	14·05	39	11·72	3·75

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JANUARY, 1936.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure. at 9 a.m.	SHADE TEMPERATURE.						RAINFALL.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·74	90	72	101	30	67	24	986	14
Herberton	..	83	65	94	29	59	26, 27, 29	720	14
Rockhampton	29·83	89	72	96	14, 17, 24, 29	68	27, 8	598	11
Brisbane	29·91	84	68	97	24	62	19	573	15
Darling Downs.									
Dalby	29·87	89	64	104	29	56	19, 20	325	7
Stanthorpe	..	82	59	100	29	53	19	288	14
Toowoomba	..	84	61	99	29	57	2, 31	424	13
Mid-Interior.									
Georgetown	29·77	97	74	103	24, 25	69	14	817	12
Longreach	29·76	100	74	111	29	66	13	432	5
Mitchell	29·81	92	69	107	24, 25	60	7	370	10
Western									
Burketown	29·74	98	78	107	5	72	19	127	7
Boulia	29·73	102	77	114	29	67	6	229	6
Thargomindah	29·76	97	75	113	25, 28	63	6	322	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March, 1936.		April, 1936.		MOONRISE. Mar., 1936.	MOONRISE. April, 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·46	6·24	6·2	5·50	1·27	2·29
2	5·46	6·23	6·3	5·49	2·20	3·2
3	5·47	6·23	6·3	5·48	3·9	3·33
4	5·47	6·22	6·4	5·46	3·49	4·3
5	5·48	6·21	6·4	5·45	4·26	4·33
6	5·48	6·21	6·5	5·44	5·0	5·3
7	5·49	6·20	6·5	5·43	5·30	5·35
8	5·49	6·19	6·6	5·42	6·0	6·10
9	5·50	6·18	6·6	5·41	6·29	6·45
10	5·50	6·16	6·7	5·40	7·0	7·27
11	5·51	6·15	6·7	5·39	7·32	8·14
12	5·51	6·14	6·8	5·38	8·8	9·7
13	5·52	6·12	6·8	5·37	8·45	10·2
14	5·52	6·11	6·9	5·36	9·29	11·1
15	5·53	6·10	6·9	5·35	10·19	
						a.m.
16	5·54	6·8	6·10	5·34		12·5
17	5·54	6·7	6·10	5·34	11·14	1·7
					a.m.	
18	5·55	6·6	6·11	5·33	12·11	2·11
19	5·55	6·5	6·11	5·32	1·15	3·16
20	5·56	6·4	6·12	5·31	2·18	4·23
21	5·56	6·3	6·12	5·30	3·24	5·30
22	5·57	6·2	6·13	5·29	4·31	6·42
23	5·57	6·1	6·13	5·28	5·39	7·53
24	5·58	6·0	6·14	5·26	6·47	9·0
25	5·59	5·59	6·14	5·25	7·57	10·2
26	5·59	5·57	6·15	5·24	9·8	10·58
27	6·0	5·56	6·15	5·24	10·15	11·48
						p.m.
28	6·0	5·54	6·16	5·23	11·18	12·28
29	6·1	5·53	6·16	5·22	12·15	1·2
30	6·1	5·51	6·17	5·21	11·6	1·35
31	6·2	5·50			1·51	

Phases of the Moon, Occultations, &c.

8 Mar.,	○ Full Moon	3 13 p.m.
16 ,,	☽ Last Quarter	6 35 p.m.
23 ,,	● New Moon	2 13 p.m.
30 ,,	☾ First Quarter	7 22 a.m.

Apogee, 10th March, at 2.18 p.m.
Perigee, 23rd March, at 7.24 p.m.

Neptune, which is never visible to the naked eye and takes 164½ years to get around the Sun, will be in opposition to it on the 6th, rising as the Sun sets.

On the 21st the Sun will be on the celestial equator at the time of rising. Whoever will then carefully note its position on the horizon with reference to some fixed object, and repeat the observation at the time of sunset, provided a clear view of the western horizon near sea level can be obtained, will have accurate points for east and west, from which equally accurate points for north and south can be obtained.

The path of the Moon for March, commencing at 8 p.m. on the 1st will be almost on the border line between Taurus and Gemini, slightly more than three times the diameter of the Cross to the North East of Aldebaran. It will reach Cancer early in the morning of the 4th, and be on its eastern border very nearly on the 6th, and on the eastern border of Leo about 5 a.m. on the 9th. It will be in Virgo till the 12th (passing about three degrees south of Spica on the 11th), in Libra, and a narrow portion of Scorpio till the 15th, in Orphincus till the 16th; in Sagittarius till the 19th, passing across the bow of the archer and near a fairly bright star of second magnitude near its right hand, pointing the arrow at the Scorpion. It will pass through Capricornus till the 21st, through Aquarius till the 22nd, through Aries, south of Hannal and Mesartim, two second magnitude stars, till the 26th, then into Taurus, passing between the Pleiades and Hyades until the 29th, and through Gemini till the 31st, at 8 p.m.

Mercury rises at 3.42 a.m., 2 hours 4 minutes before the Sun on the 1st, and at 4.12 a.m., 1 hour 41 minutes before it on the 15th.

Venus rises at 3.20 a.m., 2 hours 22 minutes before the Sun on the 1st, and at 3.47 a.m., 2 hours 6 minutes before the Sun on the 15th.

Mars sets at 7.40 p.m., 1 hour 16 minutes after the Sun on the 1st, and at 7.15, 1 hour 5 minutes after it on the 15th.

Jupiter rises at 11.51 p.m. on the 1st, and at 11.0 p.m. on the 15th.

Saturn sets at 6.36 p.m. on the 1st; on the 15th it rises at 5.7 a.m.

7 April,	○ Full Moon	8 46 a.m.
15 ,,	☽ Last Quarter	7 21 a.m.
24 ,,	● New Moon	10 32 p.m.
28 ,,	☾ First Quarter	9 16 p.m.

Apogee, 6th April, at 3.36 p.m.
Perigee, 21st April, at 6.12 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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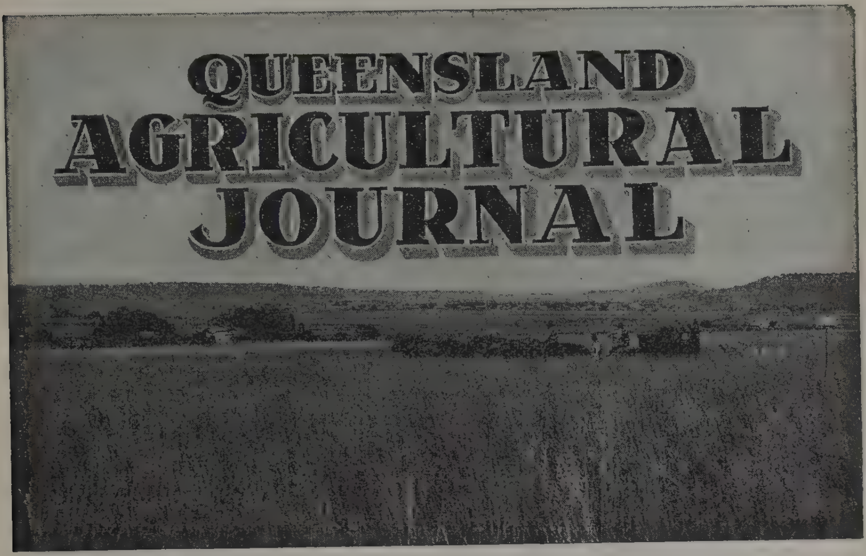

VOL. XLV. 1 APRIL, 1936. PART 4

Event and Comment

Quality of Queensland Butter.

COMMENTING recently on the marked increase in the proportion of choice quality butter produced in Queensland, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, pointed to the legislation passed in Queensland in recent years to induce the production of larger quantities of the choicest butters, and he claimed that the policy thus applied was steadily making itself felt, and that the latest statistics probably represented the highest quality yet reached in Queensland.

The details for February were particularly encouraging, the Minister added, and indicated that factory managements and the dairy farmers generally were realising the absolute necessity for producing the largest possible range of choice butters. This production constituted a direct answer to those who said that Queensland, owing to climatic and geographical conditions, could not produce a large range of the most desirable grades of butter.

Co-operation—A Swedish Example.

SWEDEN provides an outstanding example of the success of scientific organisation as applied to rural industry. An all-embracing system of co-operation in that country provides for definite benefits for both producer and consumer, and recognises the mutual dependence of town and country interests and industries. Sometimes we, in our desire to further the claims of rural industries, are inclined to ignore their economic relationship with urban industries. Good conditions in the city mean a good market for primary products, and fair prices to the farmer mean a good market for our own manufactures.

Scattered over Sweden, which is not a very large country and where agriculture is subject to severe climatic penalties, are 3,500 co-operative shops for household supplies. Quickness, politeness, and smartness are characteristic of the service in these establishments. These shops are maintained by a co-operative society, and they are conspicuous symbols of the success of Sweden's co-operative movement. Five years ago this society—the Swedish Co-operative Union—went into foreign trade, and its turnover in that branch of its activities is already in the millions.

There are many ramifications of co-operative enterprise in Sweden, including numerous buying and selling societies. There are, for instance, as many as 1,500 organisations purchasing electrical power wholesale and distributing it co-operatively to farmers and householders generally.

The success of the co-operative movement in Sweden has been due to the quality of leadership among farmers and distributors, as well as to the intelligence and loyalty of its members. The co-operative societies there, notwithstanding their success, have not put private enterprise for profit out of business. The co-operative businesses are for the use and service of members only; they do not pile up surpluses and undersell to the general public. They stand ready to push into the preserves of private capital only when the price position becomes abnormal. Thus the co-operative movement has not created a revolution, but has acted as a stabiliser—a guarantee of reasonable prices to both producer and consumer.

The Farm Produce Agents Act.

EVERY farmer who disposes of his produce through an agent should be conversant with the provisions of the Farm Produce Agents Act. The Act was passed to ensure closer supervision over dealings as between the agent and his principal, i.e., the person who sends consignments of farm produce to him for sale on his (the owner's) behalf. The term "farm produce" includes cereals, grain, vegetables, potatoes, and other edible roots and tubers, fruit, hay, and chaff, and all dairy produce; the term also includes live or dead poultry, and game and eggs.

If farm produce is supplied to any person on that person's order and at a fixed price a straight-out sale is effected, and, as no question of agency arises, the transaction does not come within the scope of the Act. However, a trader, whether a merchant or any other person, is not entitled to accept from a grower consignments without a specific agreement as to the price to be paid. Such a price must be fixed at the time of purchase, or before the date of delivery of the produce, whichever date is the earlier.

Clause 5A, in this connection, reads:—

> "No person shall purchase any farm produce from the person by whom it was actually produced unless at the time of the purchase of the farm produce or before the delivery of the farm

> produce, whichever date is the earlier, the price for which he purchases such farm produce has been definitely fixed and agreed to by his vendor at a sum of money certain, and which sum is not to be ascertained by reference to any other transaction or otherwise.''

This clause does not refer to consignments sent to an agent for sale on the owner's behalf.

Such a clause was found necessary when it was ascertained that some traders who disclaimed the responsibilities of agents, but maintained that they were merchants, were receiving produce and later, when the produce was sold, remitting the grower such a price as they thought fit.

Account sales must be rendered within fourteen days of the date of the sale of produce, and the amount due to the grower remitted within thirty days of the date of sale. The account sales must show the name and address of the agent and of the consignor; the date of receipt and of sale or other disposition of the produce; the rate at which the goods were sold; the class, weight, or quantity received and sold or otherwise disposed of; the rate per cent. of commission charged, and details of all other charges against the produce. The grower should carefully check up account sales, and if part of a consignment has been destroyed or thrown away, the account sales should be accompanied by evidence of destruction, such as a certificate from a health inspector or an officer of the Department of Agriculture and Stock.

An agent or his employee is not entitled to purchase or be in any way concerned in the purchase of produce delivered to him for sale by a grower without having previously obtained the consent, in writing, of such grower. When such consent is given no commission is chargeable.

A grower desirous of dealing with an agent should satisfy himself that such agent is licensed under the Farm Produce Agents Act before consigning to him. This information can be obtained from the Department of Agriculture and Stock, Brisbane, or from the district Clerk of Petty Sessions if the agent is trading in the grower's locality.

Any person who has consigned farm produce to an agent for sale on commission may inspect and take copies of all entries in the agent's books and accounts which relate to the receipt and sale of the produce; or such person may, in writing, authorise another person to make such inspection and take such copies. The authorised deputy must produce his authority when required to do so by the agent. When a grower is not in a position to obtain the information he requires in this way he way write to the Department of Agriculture and Stock, Brisbane, requesting that an investigation be carried out on his behalf. Full particulars regarding dates of consignments, quantities, account sales, and any other information which may be of assistance should accompany the request, which may be directed to the Registrar, Farm Produce Agents, Department of Agriculture and Stock, Brisbane.

Passion Vine Diseases.

By J. H. SIMMONDS, M.Sc., Senior Pathologist.

THE cultivation of the passion vine in this State has not made the progress which the demand for the fruit would justify. This is due in a large measure to the presence of serious diseases which are liable to make the returns a very uncertain proposition. In the past it has been the practice to pay little attention to the culture of the vines once they have become established. Pruning and spraying are rarely attempted, although well justified by subsequent results. Before passion vine growing is placed on a sound footing growers will have to realise that the same care and attention has to be devoted to this crop as is given as a matter of course to others, such as, for instance, the grape.

Brown Spot.

Brown spot is found in all three eastern States of the Commonwealth in each of which it is regarded as one of the most serious diseases to which the passion vine is subject. In Queensland it occurs also on the granadilla (*P. quadrangularis*), the Mexican passion fruit (*P. ligularis*), and certain of the wild Passifloras, especially the white passion flower (*P. alba*).

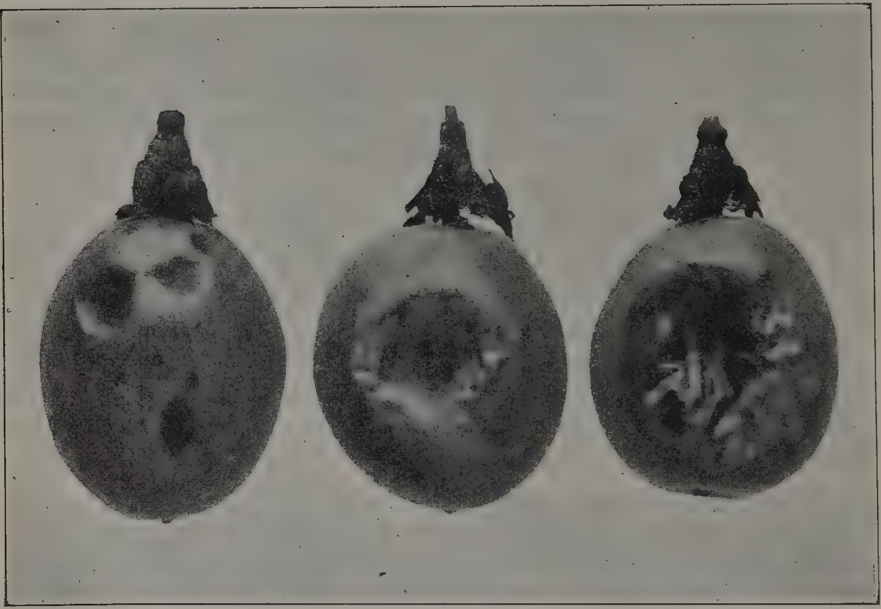

PLATE 99.
Brown spot on passion fruit.

The disease is easily recognised by the characteristic brown spots which appear on all parts of the vine. On the leaf these are from a $\frac{1}{4}$ to $\frac{1}{2}$ an inch in diameter, at first chestnut-brown in colour and later drying out in the centre to various lighter shades (Plate 100). The runners are usually attacked in the region of a leaf axil, and brown lesions, an inch or more in length, are formed which, although they develop slowly may eventually cincture the runner and cause the wilting and death of long sections of vine. Fruit spots are light-brown, circular, sunken areas which become shrunken and wrinkled as they enlarge, and may eventually occupy the whole of one side (Plate 99).

Brown spot is favoured by warm, wet weather so that it is the summer and intermediate crops which are most affected. The winter crop is usually comparatively free from the disease.

The cause of brown spot is a fungus (*Alternaria sp.*). The disease is spread by spores which are produced on the surface of the leaf, fruit, and stem lesions where they may be seen as a dusky covering. Once a leaf becomes infected it soon falls, and hence if the vines are kept reasonably thinned out the leaves with their load of spores will fall to the ground more or less out of harm's way. On the other hand, if the vines are allowed to develop a tangled mat of runners, the affected leaves are caught and held and the spores will be washed from them to other parts of the vine and so cause further infection. Pruning is therefore an important adjunct to the control of this disease besides being useful from the crop production point of view. (Plates 101 and 102.)

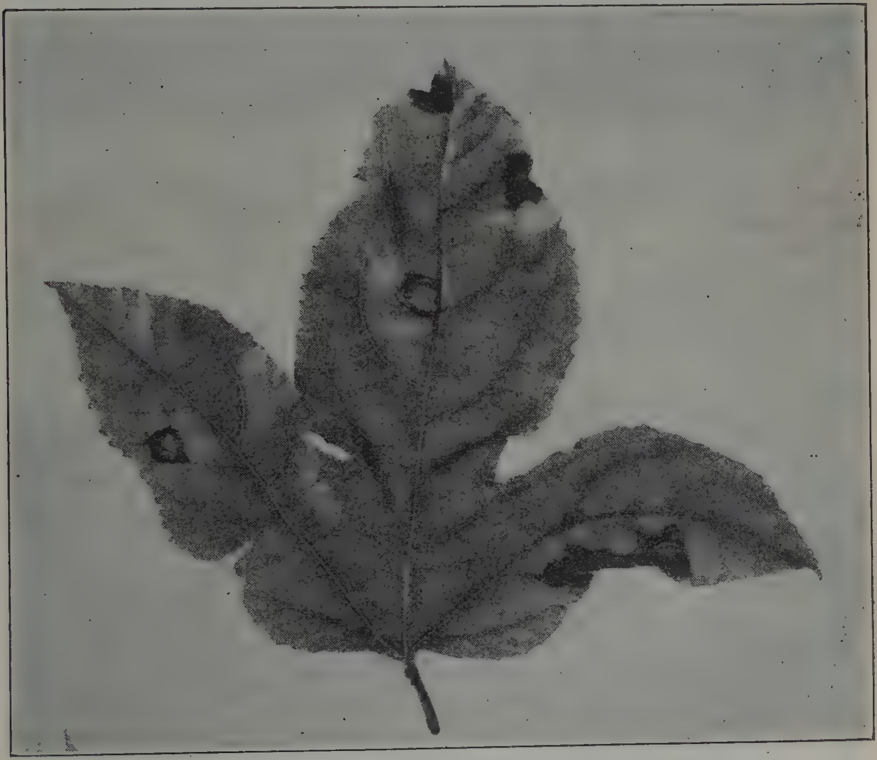

PLATE 100.
Brown spot on the leaf of the passion vine.

Control.

The following recommendations are based on experimental work carried out over a number of years:—

(1) Train the passion vine in a systematic manner right from the start, making sure that the main runners are kept well tied to their respective wires, as this will facilitate subsequent pruning.

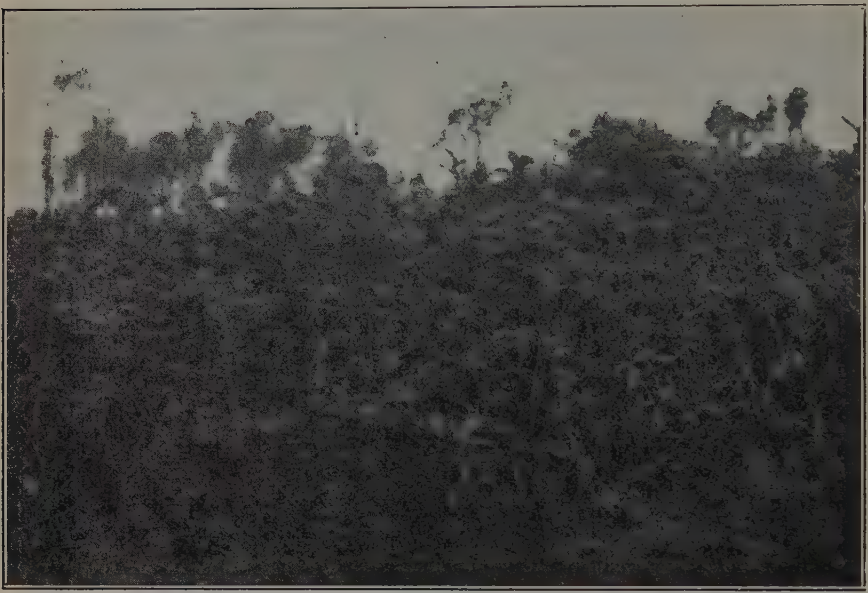

PLATE 101.

Three-year-old untreated vine from an experimental plot. Photographed 12th December, 1929. A mass of defoliated and dead runners, and very few fruit present. *Cf.* Plate 102.

PLATE 102.

Three-year-old vine similar to the one illustrated in Plate 101. Pruned third week in August. Sprayed three times with Bordeaux mixture. Photographed 12th December, 1929. Good summer crop hanging. *Cf.* Plate 101.

(2) Cut the vines well back at least once a year. The time of pruning will depend largely on local conditions, but so far as brown spot is concerned the vines need to be fairly thin during the spring months when the disease is on the increase. Hence, when a heavy summer crop is desired, pruning would need to take place before the flowers for the summer crop are formed, usually about July or August. In districts where the intermediate and winter crop is most favoured pruning should be delayed until the summer crop has commenced to form, as by so doing this crop will be reduced with a resultant increase in subsequent crops.

If woodiness is present in the plantation special precautions will have to be taken during pruning. This matter is fully discussed in connection with the latter disease. Heavy pruning should not be carried out when the vines are suffering from dry weather, as extensive dieback may result.

(3) Follow the pruning with a Bordeaux mixture spray of 4-4-40 strength. For best results this spray should be repeated once a month until the end of January, and then once every six or eight weeks until next pruning. When mature fruit are on the vine ammoniacal copper carbonate may be substituted for the Bordeaux. It is a waste of time to spray old, unpruned vines carrying a dense mass of foliage.

For the first eighteen months most attention should be paid to training the young vine, spraying, except during the winter for scab, being not always necessary.

Scab.

This second foliage and fruit disease is of minor importance, since it occurs only during the winter months and is restricted mainly to districts of high altitude, such as Tamborine Mountain and Springbrook, where the cool, moist conditions favour its development.

It is only the younger shoots and fruit that are attacked by this disease—hence it is young vines which suffer most. On the leaves and young shoots appear small circular translucent spots which eventually become covered with a greyish powdery mass of fungus spores. As in the case of brown spot, affected leaves fall rapidly. Similar spots are formed on the fruit, but later the tissue beneath these grows out into a hard raised scab of about $\frac{1}{8}$-inch diameter (Plate 103). Although the pulp is uninjured the disfigurement is often sufficient to make the fruit unfit for market. The fungus causing this disease is a strain of *Cladosporium herbarum*.

The control measures practised in the case of brown spot are applicable to this disease also. That is to say, the vines should be kept reasonably thinned out, and they should be sprayed during the autumn and winter months with Bordeaux mixture, making certain that the younger shoots and fruit are kept well covered. If it is desired to avoid staining the fruit ammoniacal copper carbonate can be substituted for the Bordeaux, although it is not quite so efficient a spray.

Since more permanent injury can be caused by this disease to young vines up to two years old special care should be taken during this period.

Base Rot.

Unless the plantation is in a neglected condition base rot usually affects a few isolated vines only. A soft decay of the base of the stem and upper part of some of the main roots takes place (Plate 106). The

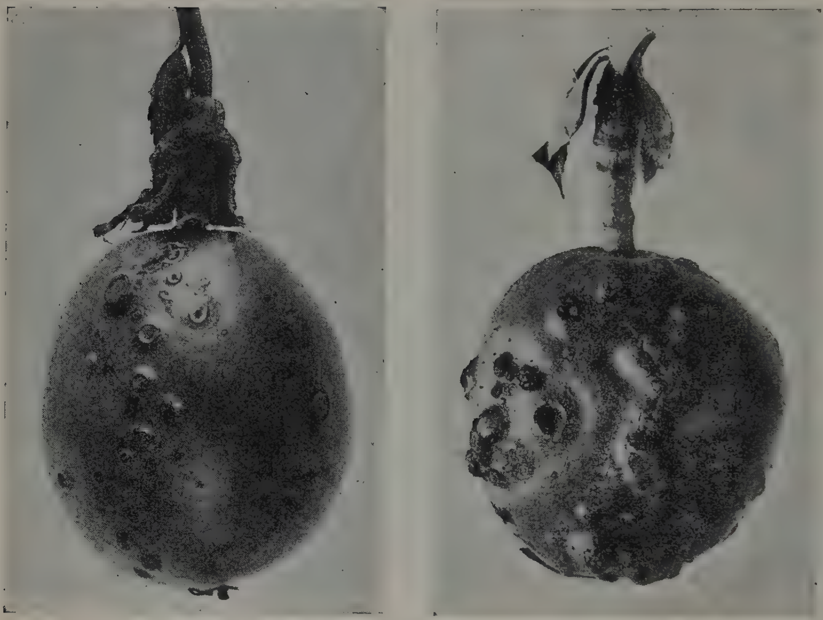

PLATE 103.
Early and late stages of scab formation on fruit of the passion vine.

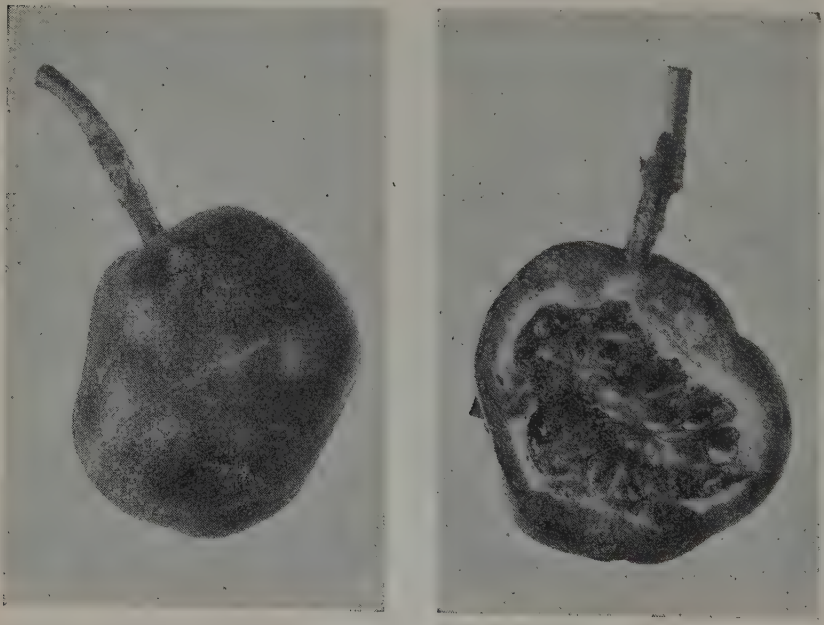

PLATE 104.
External and internal symptoms of woodiness in passion fruit.

process is usually slow, so that an affected plant may linger for months until its water supply is finally completely cut off, when it rapidly wilts. When the vine is in a particularly vigorous condition new tissue will often be formed on the outside as fast as it becomes decayed within, with the result that the base of the stem becomes a hollow structure several times its normal diameter and the vine itself is little the worse.

The exact cause of this disease in Queensland has not been ascertained, but it appears to be a soil-frequenting organism entering by way of injuries to the base of the plant. Care should therefore be exercised during cultivation not to injure the crown or main roots. Pulling weeds away by hand is advisable where necessary. The plants should be kept in a healthy, vigorous condition by good cultural practice, so that if they become infected they will outgrow the disease.

Woodiness.

Woodiness is a disease of a very different type from those already dealt with, by reason of the fact that it is not caused by a fungus parasite but by an ultramiscroscopic virus, such as in the case of bunchy top of the banana. Although this disease has been known for many years in New South Wales, it is only since about 1931 that it has assumed serious proportions in Queensland. Now it has to be reckoned as the most important passion-vine malady. The situation is made more serious by the absence of a definite lesion, such as a spot or rot. Many growers thus fail to recognise the presence of a disease, take no precautionary measures, and are at a loss to understand why their vines are no longer profitable.

The foliage symptoms of woodiness are somewhat obscure. The younger leaves are crinkled and puckered in contrast to the smoothness of the normal ones (Plate 105). The lobes of leaves produced in the winter may be drawn out into a rather narrow, elongated, and often irregular shape. This feature is often a means of detecting the disease later in the year when other symptoms are obscured. With careful examination a faint light-green mosaic or mottling can often be seen. On the older leaves the disease can often be recognised by the presence of numbers of small circular yellow spots about one-sixteenth of an inch in diameter scattered between the veins. When infected with woodiness a vine retains for a time a fairly healthy general appearance, but in time a stunting and coarse, unnatural development is evident. The fruit are characteristic and easily recognised. They are usually small and misshapen, and have a thick, hard, woody rind. This reduces the size of the fruit cavity, from which the pulp is largely or entirely absent (Plate 104).

As with a number of other virus diseases, the symptoms of woodiness are suppressed by hot weather, with the result that a vine may bear a fairly normal summer crop and look apparently healthy at the time, only to produce a crop of worthless woody fruit in the winter. Eventually, however, even the summer crop will become unprofitable.

The virus causing woodiness is located in the sap of a diseased vine. It is infectious, and the disease can be transmitted from a diseased to a healthy vine by transferring sap from the one plant to the other on the hands or pruning knives. Although not definitely proved, it is evident that the disease is also carried by certain sucking insects that feed on the passion vine.

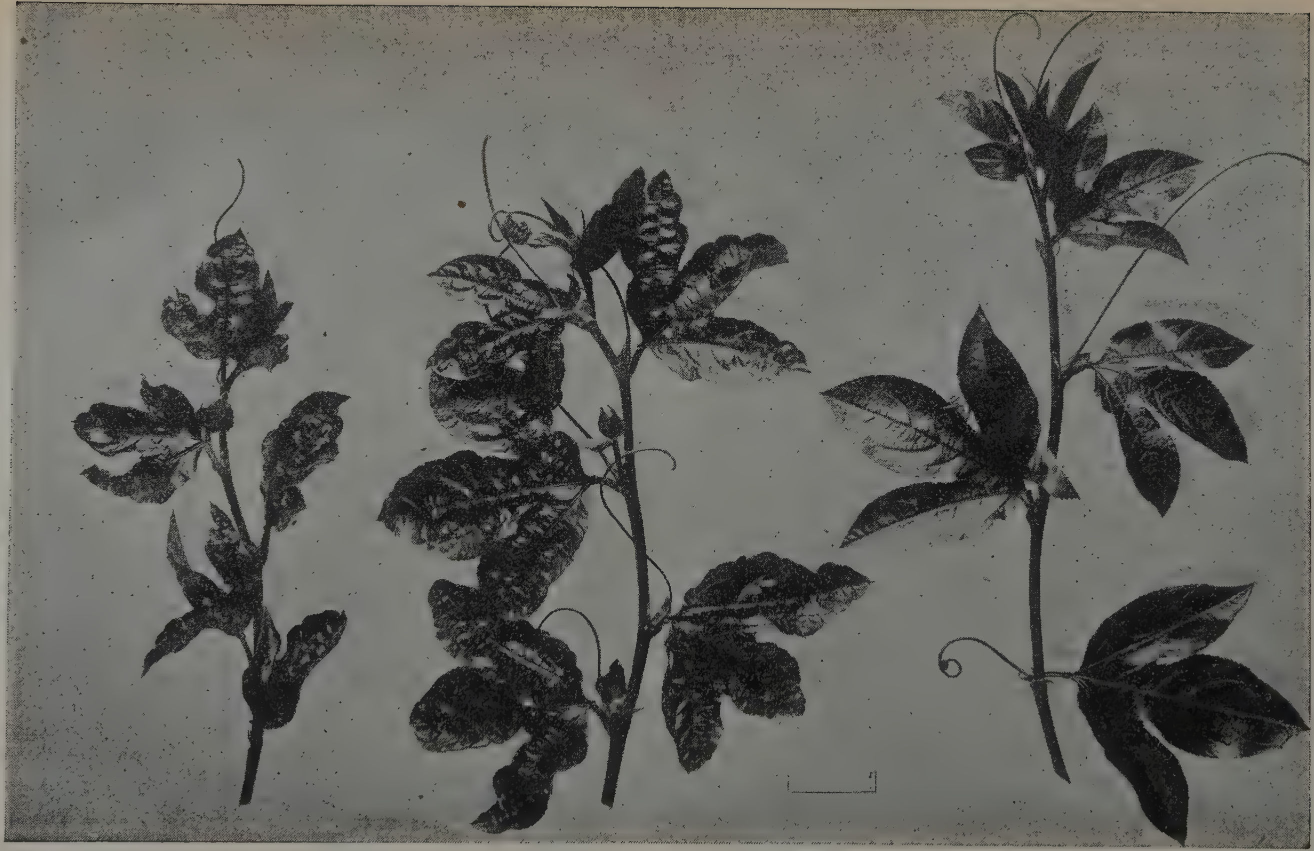

PLATE 105.

The foliage symptoms of woodiness in the passion vine. The two shoots on the left diseased. The one on the right healthy for comparison.

The wild white passion flower (*P. alba*) is also subject to the woodiness disease, as has been shown by cross inoculation. The foliage symptoms in this host are more pronounced than in the cultivated vine, and casual observation discloses that a large proportion of the wild plants are carrying the disease. These form centres from which the cultivated passion may become infected, and in some districts form a definite menace for this reason.

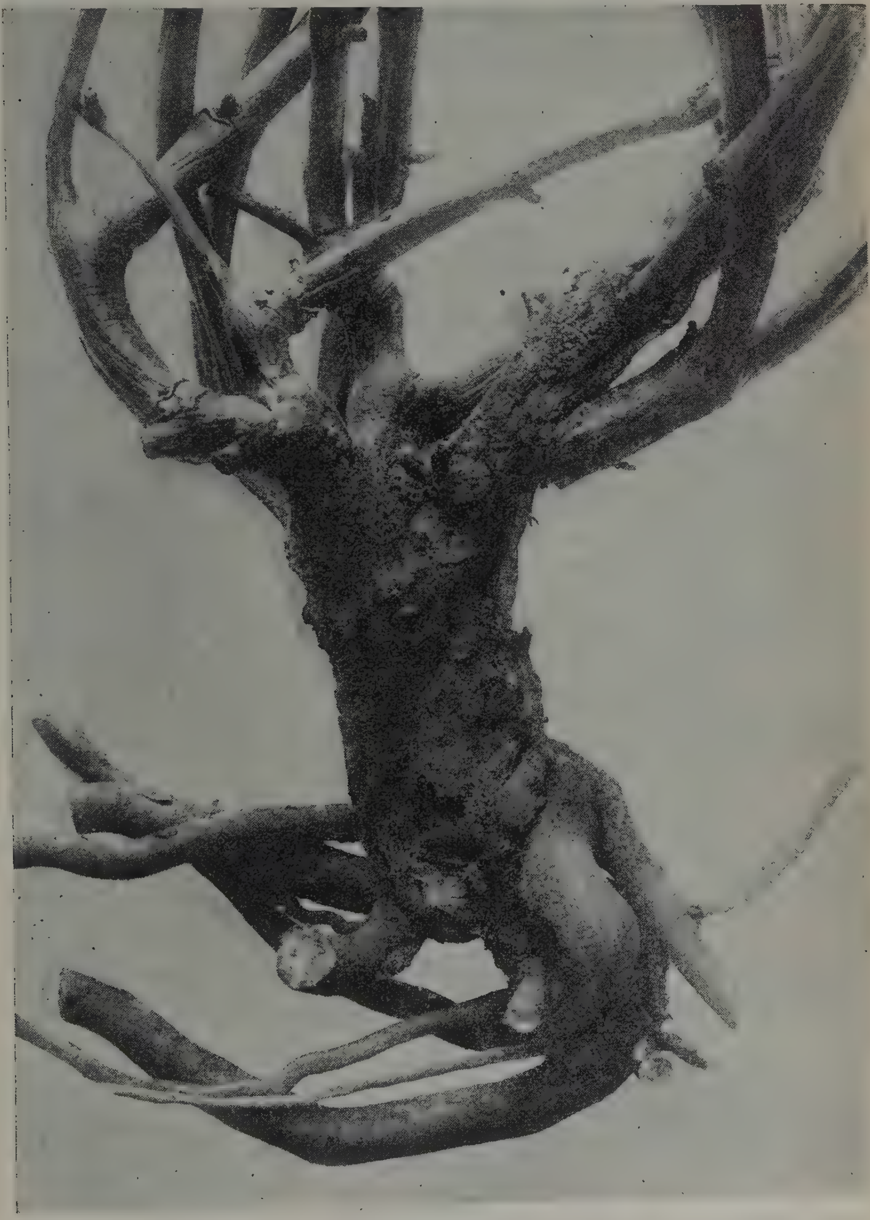

Plate 106.
Base rot of passion vine.

Control.

1. Obtain seed from a healthy vine, and grow young plants as far as possible from other cultivated and wild ones. Inspect them carefully before planting out, and discard any showing the yellow spotting or other symptoms of woodiness.

2. If a plantation has only a few vines affected, these should be cut off at ground-level and allowed to die where they stand, thus eliminating them as a source of virus without rubbing them against healthy vines with which they may be intermixed. Frequent inspection should be made, and any more showing up from time to time should be eliminated in the same manner.

3. If a plantation is heavily infected, it is necessary to choose between digging out and replanting or obtaining what summer crop is possible before the vines deteriorate too far. In the latter case, pruning should be omitted, or else directed to obtaining a summer crop rather than a winter one in which the disease may be expected to appear. Once a plantation becomes unprofitable, all the vines should be destroyed so that they do not remain as a menace to young areas. It may be found advisable to have a sequence of plantings so that when one area becomes too depleted by the removal of infected vines a younger one will be available to take its place. The different plantings should be isolated as far as possible.

4. Special precautions must be taken when pruning, and if a woody vine is handled by mistake, the hands and pruning knife should be washed well in methylated spirits or soapy water before proceeding to healthy ones. It would be a wise precaution to do this as a routine matter at regular intervals after every few vines had been attended to. A careful inspection should be made a week or two before pruning, in order to allow time for any infected vines to be dealt with as prescribed above.

5. Destroy all plants of the white passion flower growing in the vicinity of the plantation.

ATTACHMENT FOR SAW HORSE.

A stirrup iron attached to a short piece of chain and fastened to the saw horse

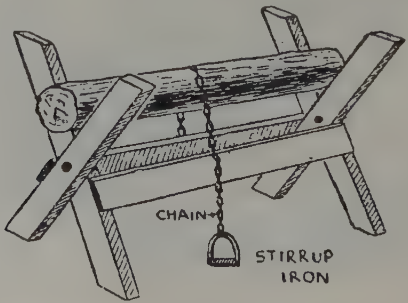

PLATE 107.

as shown in diagram, is very useful for keeping timber steady. The chain has only to be thrown over the log and the foot placed in the stirrup.

Leaf Miner and Stem Borer of Tobacco in North Queensland.

Col. M.V.

By D. O. ATHERTON, B.Sc.Agr., Assistant Entomologist.

(*Continued from March,* 1936.)

CONTROL OF LARVÆ.

BOTH species continue breeding in old tobacco plants left standing in the field even after all the leaf has been picked. This capacity for survival in crop residues led to the inclusion of a clause in "*The Tobacco Industry Protection Act of* 1933" providing for the eradication of tobacco plants on the completion of harvesting.

Passing to the possibility of insecticidal control, it is obvious from the larval habits already described that neither species is likely to be controlled by contact insecticides.

As the epidermis is rejected when entering the plant, the chance of success with stomach poisons did not seem to be much brighter. However, many authors have recommended arsenicals for the control of *P. operculella,* and numerous growers insisted that lead arsenate gave control in seed-beds at Mareeba. Under the circumstances, some investigation of this insecticide, employed either as a spray or a dust, was inevitable. The spray form has been frequently used in the past by local farmers, and recommended in the literature of Australia and other countries.

Legislation.

To enforce the removal of crop residues and reduce the number of live tobacco plants during the winter months, the following clause was included in "*The Tobacco Industry Protection Act of* 1933":—

"19. (1) Every occupier (or where there is no occupier, then the owner) of land used in the growing of tobacco plants shall, within one calendar month after the leaf has been harvested from the plants growing on such land, uproot the whole of the plants on such land and destroy such plants in a manner to be prescribed.

"(2) Where an area of land is comprised of two or more contiguous paddocks in the occupation of the same person or belonging to the same owner, the uprooting and destruction of the plants shall be effected within one calendar month after the leaf has been harvested from each individual paddock.

"(3) Where there have been plantings at separate intervals in different parts of the one area, the uprooting and destruction of the plants shall be effected within one calendar month after the harvesting of the leaf from each separate planting.

"(4) An inspector may enter upon any land upon which tobacco plants are present and have not been dealt with as prescribed and cause the same to be uprooted and/or destroyed at the expense of the occupier, or where there is no occupier, then the owner.

"(5) Any person failing to comply with the provisions of this section shall be guilty of an offence against this Act and shall be liable to a penalty not exceeding fifty pounds."

It is impossible to give figures proving the value of rigidly enforcing this measure, but there is no doubt that it must decrease the number of moths which survive the winter to initiate the spring infestation.

Lead Arsenate Spray.

Applied in spray form on plants in the field, lead arsenate has proved ineffective against the leaf miner (Weddell, 1934). It also failed to prevent infestation by this pest in experimental seed-beds when applied at the rate of 1½ oz. per gallon of water, though treated beds were not so severely attacked as controls. The mixture mentioned is three times the normal strength, and is the concentration for which Mareeba growers claimed success. This experimental evidence obtained during the investigation indicates that a wet spray of lead arsenate is ineffective in the field and little better in seed-beds against leaf miner. There is no evidence of its value against stem borer.

Lead Arsenate Dust.

Laboratory experiments showed that a dust cover of lead arsenate reduced the effective attack by stem borer larvæ hatched on treated leaves by about 60 per cent. A dust cover of inert kaolin afforded no protection against larvæ of that species.

The results obtained with the dust against the leaf miner in the laboratory can be summarised briefly. The effective penetration by larvæ hatched from eggs placed on dusted leaves was reduced by about 60 per cent. Developing leaf miners of all stages, after removal from untreated plants, were unable to mine successfully in dusted leaves. Mines were often begun on these leaves, but they were never carried on to any extent, although dead larvæ were sometimes observed at or in such incipient mines. Larvæ removed from untreated plants, starved for several hours, then released on dusted leaves, died before mining to any extent. No protection against leaf miner was afforded by a dust cover of kaolin.

The effect of dusting seed-beds with lead arsenate was observed experimentally, and it was noted that dusting twice a week afforded some protection against leaf miner. The efficiency seemed to vary directly with the concentration of the dust up to 75 per cent., but a concentration of 50 per cent. was considered suitable. More extensive trials of the dust at this concentration were made, but for convenience their discussion is postponed till later.

A seed-bed in which plants were pricked out 6 inches apart was used to determine whether more frequent applications of the dust would give more effective protection. One section of the seed-bed was dusted with 50 per cent. lead arsenate daily after watering, while another section was untreated. This procedure was followed for two and a-half weeks, and the result definitely indicated that such treatment was decidedly useful, dusted plants being very slightly infested compared with the controls (Plate 9; fig. 2—see p. 30, January issue).

As the larvæ do not consume the epidermis when commencing a mine, these results are somewhat difficult to explain. Obviously the effect of the arsenical dust is not mechanical only, as the ineffectiveness of the kaolin shows, but possibly larvæ wandering about on dusted leaves are contaminated with the poison, carrying it into the mine and polluting the interior.

Ovicides.

Owing to the exposed nature of the places in which they are laid, the eggs of both species can be reached by ovicides; but, as the egg-stage occupies not longer than four or five days in summer, an effective ovicide would need to be applied every three or four days to give control. Thus the use of ovicides would necessarily be confined to seed-beds, as the labour costs for field treatment would be prohibitive.

Some exploratory investigations of ovicides were conducted in the laboratory in two series. In the first series the eggs were treated in petri dishes, and the more promising ovicides were then tested in a second series against eggs placed on the leaves of plants. Only leaf miner eggs laid on the cloth covers of breeding jars in the laboratory were used, and none had been laid more than a day at the time of treatment.

Kerosene Emulsion.

The mixture was composed of 2½ per cent. kerosene emulsified with soft soap in water. Thirty-nine eggs were placed in the petri dish and sprayed till thoroughly wet. On the third day after treatment several eggs had hatched, and observations made a fortnight after treatment showed that ten of the eggs, or 25·5 per cent., had failed to hatch. In most of the unhatched eggs development had proceeded up to a point, and therefore it is suggested that the toxic effects are not immediately felt by the embryo. This spray was not considered in the second series of trials.

Linseed Oil and Soft Soap.

Forty-nine eggs were sprayed in the petri dish, and three days later the eggs were still unhatched and lacked their normal lustre. A fortnight after treatment an examination showed that only one larva had emerged—i.e., 98 per cent. of the treated eggs failed to hatch. The oil seemed to desiccate the eggs, and their contents shrivelled within a short time of treatment. In the second series twelve eggs were used, and within twelve hours after treatment spray injury appeared in spots on the leaf, and eventually practically the whole leaf succumbed. Seven of the eggs hatched, and one larva became established on the leaf. In a supplementary trial four larvæ were placed on a previously sprayed leaf, but none established mines.

Lime Sulphur.

In the first series thirty-three eggs were treated with a 1 in 50 dilution of commercial lime sulphur. Three days later some of the eggs hatched, and after a fortnight larvæ had emerged from all but nine, thus giving an apparent kill of 27·3 per cent. In the second series twelve eggs were used and treated with a 1 in 40 dilution of lime sulphur. Ten of these eggs hatched, and in due course six of the larvæ established mines. In a supplementary trial with this spray four larvæ were placed on a previously sprayed leaf, and one successfully established a mine.

White Oil.

Forty-six eggs were treated in a petri dish with a 1 in 50 dilution of a white oil, and although some eggs had hatched in three days, 30, or 65·3 per cent., had failed to yield larvæ a fortnight after treatment. There had been some development in the unhatched eggs after treatment. Twelve eggs were placed on a leaf in the second series and then sprayed with a 1 in 40 dilution of white oil, and all these eggs hatched, although only one larva successfully established a mine. In the supplementary trial with this spray none of the four larvæ placed on a previously sprayed leaf established a mine.

Precipitated Sulphur.

A greyish precipitated sulphur with the following analysis—sulphur 99·6 per cent., ash 0·2 per cent., chancel degree of fineness 85 per cent.—was also used in this experiment. In the first series fifty-seven eggs were treated, and after four days some had hatched, while a fortnight later only thirteen remained unhatched, representing an apparent kill of 23 per cent.

Control.

Thirty-one untreated eggs were used as a control, and two of these remained unhatched after fourteen days, this representing a natural mortality of 6.4 per cent.

From the above data it is apparent that white oil and linseed oil and soap might have some value as ovicides. The latter, however, can be useful only if a concentration innocuous to the plants can be devised. One interesting fact emerging from these trials is that lime sulphur, which has reputed ovicidal properties, proved comparatively ineffective.

A further trial of white oil as the most promising ovicide was arranged in experimental seed-beds. At a concentration of 2½ per cent. the spray induced serious injury in the foliage of small seedlings, and the effect on leaf miner infestation was completely masked. However, the progress of leaf miner control in seed-beds by other means reached such an advanced stage that no further work on either white oil or linseed oil and soap was considered necessary.

CONTROL IN SEED-BEDS.

During the course of experiments with sprays for the control of blue mould in tobacco seed-beds at Mareeba it was observed that beds sprayed with either colloidal copper or copper emulsion remained comparatively free of leaf miner and stem borer so long as the sprays were applied regularly (A. V. Hill, personal communication), but when spraying was discontinued the pests appeared in the plants of such seed-beds. These observations led to the inference that copper sprays exerted some control on the pests, but strictly controlled commercial seed-beds were necessary for confirmation. Such seed-beds were also required to confirm the laboratory results with lead arsenate dusts, and a comprehensive seed-bed experiment was therefore designed and conducted at Mareeba.

No seed-bed site was available in which both pests were prevalent, but the eggs and newly emerged larvæ of both species are so much alike that measures which check one can be expected to check the other, and leaf miner was selected as the most suitable species for attention. The site chosen was part of a field which had been cropped for three years, and was only about 50 yards from some previously established seed-beds which were heavily infested by leaf miner and were expected to supply a suitable infestation in the experimental beds.

The treatments compared were as follows:—(*a*) Colloidal copper spray followed by 50 per cent. lead arsenate dust next morning; (*b*) colloidal copper alone; (*c*) control plots—untreated; (*d*) copper emulsion spray alone; (*e*) copper emulsion followed by 50 per cent. lead arsenate dust next morning; (*f*) 50 per cent. lead arsenate dust alone.

Notes on the preparation of colloidal copper and copper emulsion sprays have been published by the Queensland Department of Agriculture and Stock (Mandelson, 1933).

Six seed-beds were prepared side by side, each 3 feet wide and 30 feet long, and separated from its neighbour by a 2-foot pathway, with its longitudinal axis approximately north and south. Before sowing, each seed-bed was divided into six 5-foot sections, thus providing thirty-six plots, and as six treatments were included, this arrangement allowed the appearance of each treatment once in each seed-bed (Table 13).

TABLE 13.

Yield of "Plantable Plants" from each Plot in the Experimental Seed-beds at Mareeba. Yield given in Number of Plants in a Representative 3-square-feet Section from each Plot.

East.

a 142	*b* 202	*c* ..	*d* 151	*e* 88	*f* ..	*A*
b 31	*c* ..	*d* 155	*e* 166	*f* 130	*a* 71	*B*
c ..	*d* 72	*e* 160	*f* ..	*a* 278	*b* 223	*C*
d 14	*e* 79	*f* 12	*a* 132	*b* 30	*c* ..	*D*
e 40	*f* ..	*a* 66	*b* 183	*c* ..	*d* 62	*E*
f ..	*a* 68	*b* 26	*c* ..	*d* 33	*e* 44	*F*

West.

Seedlings germinated in from five days to seven days, and the treatments were first applied twelve days after sowing, applications being made thereafter twice a week for the duration of the experiment. On the day selected for spraying all the seed-beds were watered in the afternoon, and the (*a*) and (*b*) plots and the (*d*) and (*e*) plots were then sprayed with colloidal copper and copper emulsion respectively. The following morning all the seed-beds were watered early, and afterwards the (*a*), (*e*), and (*f*) plots were dusted with 50 per cent. lead arsenate. The amount of spray required to effectively treat the seedlings increased from four-fifths of a gallon during the early stages to 1½ gallons per 90 square feet at the conclusion of the experiment. The dust was applied as evenly as possible, and on no occasion was a heavy coating of dust visible on the treated plants.

About three weeks after the appearance of the seedlings there were two light storms, each yielding about 30 or 40 points of rain. Blue mould occurred at this time in one of the (*f*) plots, and in this plot killed about half the seedlings. Apparently the dry weather checked the outbreak, and there was no further occurrence of the disease. A few days after the rain a small Pyraustid moth, *Loxostege affinitalis* Led., was common in the seed-beds, and by the time the seedlings were four to five weeks old its larvæ were present in the undusted plots, particularly in the untreated (*c*) plots. No second generation of this pest appeared, and it was not responsible for any serious damage. There had been very little invasion of the experimental area by moths from the old infested seed-beds when the seedlings were four weeks' old. It was therefore considered advisable to collect leaf miner moths immediately by sweeping over the old seed-beds and to transfer the catch to the experimental area. This procedure was adopted and proved successful in augmenting the population of the experimental seed-beds.

With the exception of the light storms already mentioned, the weather was very dry. This probably accounts for the relative freedom from blue mould even in the untreated (*c*) plots. In the early stages of growth the copper sprays were undoubtedly responsible for the smaller size of sprayed plants compared with those in the control plots, but after five or six weeks the depredations of leaf miner in the (*c*) and (*f*) plots precluded comparisons of growth. The stunting effect was in all probability due to the waterproofing action of the sprays on the surface of the soil, and from this point of view the colloidal copper was the less undesirable of the two sprays.

Three weeks after the introduction of leaf miner moths in numbers the (*c*) plots were practically destroyed by leaf miners, little more than the stalks being left (Plate 9), and at the same time the leaf miner infestation of the dusted (*f*) plots was generally evident. Sprayed plots were not seriously attacked by leaf miner at this stage, though in parts obviously stunted where the surface was encrusted with spray residue.

The necessity for the employment of statistical methods of analysis in the interpretation of results obtained during the investigation of agricultural problems cannot be overlooked, but it must be remembered that such methods have their limitations, and these limitations are nowhere more evident than in entomological research. The methods developed during recent years depend on the adoption of some definite measurable criterion for the comparison of results obtained by varying one factor of production, but in entomological research it is often impossible or impracticable to measure accurately the selected criterion.

A modified Latin square layout was adopted for these experimental seed-beds, principally because such an arrangement allowed several replications of each treatment. In most field experiments where statistical methods are to be used for the interpretation of results, the criterion selected for comparison can be definitely measured—e.g., yield in lb. per acre, but in the experiment under discussion the selected criterion was not a definitely measurable quantity. The treatments involved in field trials usually necessitate the application of the varying operations twice or thrice at most, but in these seed-beds the varying treatments had to be applied twice a week for two months. Therefore, in order that risk of confusion during application should be minimised, it was considered advisable to arrange the treatments systematically rather than at random. Thus the results are not amenable to statistical analysis.

One difficulty in ascertaining the value of the treatments against leaf miner arose from the drought-producing effect of the copper sprays, the number of commercial-sized plants occurring in any sprayed plot being reduced in comparison with the number in any unsprayed plot. Finally it was concluded that counting the plants in a representative 3 square feet portion of each plot would give sufficient data for comparative purposes.

The number of commercially plantable seedlings in each plot was chosen as the criterion for analysing the value of the various treatments, and the term ''commercially plantable'' is used to describe plants large enough and sufficiently free of damage to be successfully transplanted to the field. The number of such plants obtained from a representative 3 square feet section of each plot is recorded in Tables 13 and 14.

TABLE 14.

YIELD OF "PLANTABLE PLANTS" FROM EACH OF THE VARIOUS TREATMENTS IN THE EXPERIMENTAL SEED-BEDS AT MAREEBA.

Treatment.	A.	B.	C.	D.	E.	F.	Mean.
a	142	71	278	132	66	68	126·2
b	202	31	223	30	183	26	115·8
c	..	..	..	..	..	..	0·0
d	151	155	72	14	62	33	81·2
e	88	166	160	79	40	44	96·2
f	..	130	..	12	..	..	23·7

The tabulated results of this experiment indicate that leaf miner infestation of seed-beds can be reduced by the judicious application of either colloidal copper or copper emulsion. The regular use of both sprays prolongs the life of the plants exposed to heavy leaf miner infestation by about four weeks, but colloidal copper is superior to copper emulsion, for several reasons. It is cheaper; it is easier to prepare satisfactorily; it produces no clogging of the spray nozzle during application; it has less waterproofing action on the soil surface; and, furthermore, it is slightly more efficient in leaf miner control than copper emulsion. Dusting twice a week with 50 per cent. lead arsenate apparently gives the plants some protection against the pest, though not so much as the copper sprays, the life of the dusted plants being prolonged by only two weeks compared with the effective existence of plants in the untreated control plots. The seed-bed experiments also demonstrated that lead arsenate dust used in conjunction with the copper sprays does not greatly increase the effectiveness of the latter.

These results were tentatively explained by ascribing ovicidal properties to the copper sprays. Several attempts were made to substantiate this assumption in the laboratory with eggs of both the leaf miner and the stem borer, but it was soon established that the copper sprays had no ovicidal value against either species. Two alternative theories remained: Firstly, it was possible that the foliage of the sprayed plants became toxic after repeated applications of the sprays, or, secondly, that the sprays had some deterrent action on gravid females. If the former theory were true, larvæ entering sprayed leaves should be killed, but in the laboratory newly emerged larvæ of both species successfully entered plants which had been sprayed three times, and this explanation must therefore be discarded. The other theory would explain the facts quite adequately, but it was very difficult to secure confirmation in the laboratory, though a small duplicate test gave interesting results. One sprayed plant and an unsprayed control were enclosed together under a large glass jar with moths, and although the scope for selective oviposition under these circumstances was not great, interesting results were obtained and are given in Table 15.

TABLE 15.

EGG-LAYING OF LEAF MINER AND STEM BORER ON SPRAYED AND UNSPRAYED CONTROL PLANTS.

Test.	LEAF MINER.		STEM BORER.	
	Eggs Laid on Sprayed Plant.	Eggs Laid on Control Plant.	Eggs Laid on Sprayed Plant.	Eggs Laid on Control Plant.
A	0	2	198	353
B	0	4	155	347
Both	0	6	353	702

The small number of eggs laid on the plants by leaf miner moths could be expected, as this species prefers the ground for oviposition. Twice as many eggs were laid by the stem borer moths on control plants as on sprayed plants. This may be significant when the unsatisfactory experimental design is taken into consideration, and it is thus not unlikely that these copper sprays adversely affect oviposition in sprayed seed-beds, and that therein lies the explanation of the experimental seed-bed results.

DISCUSSION AND RECOMMENDATIONS.

The information set out in this paper indicates that the losses caused locally by the leaf miner and the stem borer are relatively greater than elsewhere, and it is possible that the mild climate of North Queensland may have some bearing on this aspect of the problem. Costs are high in North Queensland, and control measures, to be practical, must dispense with the necessity for much labour on account of the expense involved.

Measures against Moths.

A reduction of losses would be achieved if it were possible to reduce the number of newly emerged or gravid females economically, and with this objective in view two methods of destroying adult moths were considered.

The moths usually fed on sugary solutions in the laboratory before egg-laying began, and it was hoped that fluid baits incorporating attractant syrups would be effective lures in the field against gravid moths.

Several such fluid baits were tested under field conditions, but the unsatisfactory results suggest that these baits do not attract the moths, and control by luring is not likely to be achieved in the future.

The use of light traps for reducing the moth population has been recommended by some entomologists from time to time, and a knowledge of the recommendations led to an experiment with light traps in the field. Several types of traps were used, but, although moths were caught, only one species—namely, the leaf miner—was taken to any extent. The percentage of females in the whole catch was low, and there was no obvious reduction in the moth population in the field. It was concluded, therefore, that although light traps attracted leaf miner moths, their influence covered only a small area and was ineffective in materially reducing the moth population.

Adults may be excluded from the seed-bed by the proper use of shade covers. A mothproof cover of calico, hessian, or stockinette is constructed and fitted with flaps by means of which the ends are effectively closed, and the sides are designed so that they are held firmly against the timbered border of the beds. Care should be taken to ensure that the shade or storm cover is really mothproof when completed and in position. Having constructed such a cover, it should not be removed except between 9 a.m. and 5 p.m., and then only for watering and hardening off the plants. This measure undoubtedly assists in keeping the seed-beds free of leaf miner and stem borer infestation, and thus aids in the production of healthy seedlings. The only danger of infestation in such protected seed-beds is that moths may be disturbed during the day and after a short flight may alight in the seed-beds, but attacks from such sources have not proved serious. The fact that this seed-bed modification favours the development of blue mould in wet seasons is a disadvantage that should not be overlooked.

Measures against Larvæ.

Neither of the two wild tobaccos has yet been discovered in the Cairns hinterland, but several solanaceous weeds known as hosts of the leaf miner occur in the area, and the destruction of weed growth in winter is thus vitally necessary in order to restrict the breeding of the pests. The leaf miner and the stem borer breed in the stalks of abandoned plants left standing in the field, and the value of the "clean up" clause in *"The Tobacco Industry Protection Act of* 1933" must accordingly be stressed, for strict attention to the requirements of this clause will reduce the numerical strength of over-wintering generations of both species.

Experimental evidence does not support the contention that lead arsenate applied as a spray is effective in controlling the leaf miner in the seed-bed or in the field, but the same insecticide applied in dust form gives much better results. Loss of healthy seedlings after transplanting can be avoided by dusting lightly and often with 50 per cent. lead arsenate and maintaining a protective dust cover continuously until the plants are about 9 inches high. If dusting is discontinued after the plants have reached this height, the danger of contamination of the harvested leaf by arsenical residues is reduced to a minimum. The objective is to maintain a dust cover protection until vigorous growth is resumed after the inevitable check associated with transplanting.

Plants which have become infested with stem borers after transplanting can often be saved. These plants should be cut back during good growing weather to the most vigorous sucker, which then develops into the commercial plant, but it is essential to wait for favourable weather before cutting back. If galls denoting stem borer attack are noticed on plants in which the growing point has not been affected, less drastic treatment is sometimes successful, and a longitudinal slit through the side of the gall with a sharp knife generally kills the larva, and, unless again attacked, the plant usually produces commercial leaf.

Ovicides.

Unfortunately, there are several inherent disadvantages in the use of ovicides against either leaf miner or stem borer. One of the chief of these is that ovicides cannot be used in the field because of the necessity for frequent applications and the high costs thus involved. Furthermore, in the seed-beds there is such a dense mass of foliage that thorough wetting of the plants is almost impossible, and it is therefore impracticable to reach eggs laid on the ground and among the glandular hairs on the lower surface of the leaves. As yet, no thoroughly effective ovicide has been developed.

Control in Seed-beds.

The advantages of using mothproof seed-bed covers have already been mentioned. On account of the prevalence of blue mould, the use of the copper sprays in seed-beds must become a routine procedure and should help in the control of both the leaf miner and the stem borer. Lead arsenate used in dust form for the control of other leaf-eating caterpillars should also decrease the incidence of the two pests under discussion. The provision of mothproof storm covers, the regular use of colloidal copper spray, and the regular dusting with 50 per cent. lead arsenate should therefore render possible the production of commercial seedlings in North Queensland.

Biological Control.

The biological control of insect pests, when effective, is a most inexpensive method, but few pests have so far been successfully controlled in this manner. Three Braconid parasites of stem borer larvæ already occur in the areas north of Bowen, and are now recorded for the first time, but, as the stem borer remains a serious pest in spite of these well-established parasites, they are obviously of little consequence as control factors. Unfortunately, overseas records have yielded evidence of the existence of only one parasite of the stem borer.

The position with respect to the leaf miner is somewhat different, for in other countries many larval parasites have been recorded, whereas in North Queensland, despite the quantity of field material handled, only one—a Braconid—has been observed. At least four of the leaf miner parasites of other countries have occurred in considerable numbers in their respective localities and are credited with partial control of the pest in certain regions in particular seasons, and it might therefore be advisable to consider the possibility of introducing some of these reputedly effective species from other countries. Steps, however, should not be taken to do so until their absence from other Australian States has been established.

SUMMARY.

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The recent increase in the area under tobacco and in the weight of commercial flue-cured leaf produced in North Queensland is paralleled by a proportionate increase in the attention paid to the control of pests connected with this crop. Two of the more destructive insect pests are the leaf miner *Phthorimœa operculella* Zell. and the stem borer *Phthorimœa heliopa* Low.

A section of this paper, in which the bionomics are described, is devoted to each of these insects. The species *P. operculella* is probably indigenous in tropical America, but is now cosmopolitan. The species *P. heliopa* apparently does not occur in that continent, but seems to be indigenous in many of the countries bordering the Indian Ocean. The present distribution of both pests is noted. Native and cultivated host plants of *P. operculella* are enumerated, and attention is drawn to the fact that no host other than tobacco is recorded for *P. heliopa* in the available literature. Two native hosts of the latter in North Queensland —*Nicotiana suaveolens* and *N. glauca*—are now recorded for the first time.

There is a brief description of the adults and copies of the original descriptions. The various life-history stages are described, with notes on the bionomics pertaining to each stage. The larvæ are discussed at some length, with notes on the injury by each species, the relationship of temperature to development, agreement with Dyar's hypothesis, and general habits. There are four larval instars in *P. operculella,* but five in *P. heliopa,* and whereas larvæ of the former require 351 ± 33, the latter require 703 ± 81 effective day-degrees for development. Attention is drawn to the fact that neither pest is in the habit of consuming any of the epidermal portion of the host. The larvæ reject the epidermis after biting it away when initiating attacks through the leaves or other parts of the plant.

The habits of the adults are described, with notes on flight and egg-laying. Whereas the stem borer habitually oviposits on the plant, the leaf miner prefers the ground near the base of the host, and seldom oviposits on the plant. Stem borer moths lay up to 400 eggs—about three or four times as many as leaf miner moths. Attention is drawn to the adult's habit of seeking seclusion during the greater part of the day. Probably ten or eleven generations annually for the leaf miner and seven or eight for the stem borer are normal under local conditions.

The immature stages, the adults, and the injury of the two species are compared. Similarities in the life histories and habits of the two are such that any measures for the control of the pests need to be similar, if not identical. The adults of *P. operculella* are attracted to lights, but those of *P. heliopa* are not.

Interesting differences in the status of natural enemies for the two species are described. Parasites of *P. operculella* are quoted from the literature, but none are recorded from Australia. There are no records of larval parasites of *P. heliopa* in other countries, but several, as yet unidentified, are now recorded from Queensland. One of these also parasitises the leaf miner locally.

Control experiments are described. The pests have been excluded from seed-beds by the manipulation of moth-proof storm covers. Honey and water and molasses and water baits were tested in the field without success. Acetylene lamps modified as four types of light traps were

tested in the field, but none of the traps were capable of materially reducing the moth population. Legislation has been introduced to enforce the removal of crop residues. Lead arsenate applied as a spray at the rate of 1½ oz. per gallon of water is not effective against the leaf miner, and is probably ineffective against the stem borer also, but the same insecticide applied as a dust seems to exert some degree of control on both species. Several ovicides were tested in the laboratory, but were ineffective. Two copper sprays, developed for the control of blue mould, *Peronospora tabacina* Adam, in seed-beds also give considerable control of the leaf miner and stem borer as well.

The interesting features of this investigation, with their effects on the control of the pests, are discussed in conclusion. Recommendations embracing practices which may be expected to reduce commercial losses, particularly in seed-beds, are advanced. The need for further investigation of the possibilities of parasite introduction is mentioned.

A bibliography is included. This embraces several papers describing methods for trapping other moths, as well as the literature on the two pests. The papers have been consulted in abstract where the original was not available, and wherever possible the reference in "The Review of Applied Entomology" is also cited.

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REFERENCES.

Angell, H. R., Hill, A. V., and Currie, G. A., 1930 (R.A.E. XVIII., p. 589.) Blue Mould of Tobacco: Progress Report of Studies on an Insect Vector. Jour. C.S.I.R. III., p. 83, Melb., 1930.

Berthan, H., 1855. On the Potato Grub of Tasmania. Proc. Roy. Soc. of Van Diemen's Land, Hobart, March, 1855.

Bondar, G., 1925. (R.A.E. XIV., p. 17.) Uma Terrival Praga da Batatinha que esta invadino as Culturas de Fumo. Chacaras Quintaes, XXXII., p. 319, S. Paulo, Oct., 1925.

Cavadas, D. S., 1927. (R.A.E. XVI., p. 287.) Greece: Bacterial Diseases of Tobacco in connection with *Gnorimoschema heliopa* in Thessaly. Int. Rev. Sci. Pract. Agric., XVIII. (N.S.), p. 693, Rome, December, 1927.

Chittenden, F. H., 1912. (R.A.E. I., p. 102.) The Potato Tuber Moth (*Phthorimœa operculella* Zell.). U.S.D.A. Bur. Ent., Circ. No. 162, December, 1912.

Cockerell, T. D. A., 1928. (R.A.E. XVII., p. 184.) Distribution of *Phthorimæa operculella* Zeller. J. Econ. Ent. XXI., p. 938, Geneva, N.Y., December, 1928.

Cushman, R. A., 1915. (R.A.E. III., p. 691.) Descriptions of some new Ichneumonidæ and Taxonomic Notes. Proc. Ento. Soc. Washington, XVII., p. 132, Washington, D.C., Sept., 1915.

De Azevedo, A., 1924. (R.A.E. XIII., p. 136.) A *Phthorimæa operculella* Zell., na Bahia. Correio-Agric., II., p. 330, Bahia, November, 1924.

De Bussy, L. P., 1914. (R.A.E. III., p. 202). Dierkundige Afdeeling. Meded. Deli Proefstat., Medan, VIII., p. 215, Sep., 1914.

Edwards, W. H., 1929. (R.A.E. XVIII., p. 104.) La teigne du Tabac, *Phthorimæa operculella.* Bull. Dept. Agrc. Ile Maurice, Ser. Sc. No. 13, Reduit, 1929.

Fisher, R. C., 1924. (R.A.E. XII., p. 560.) The Life History and Habits of *Tortrix pronubana* Hb., with Special Reference to the Larval and Pupal Stages. Ann. App. Biol., XI., p. 395, Cambridge, October, 1924.

Flanders, S. E., 1930. (R.A.E. XIX., p. 95.) Recent Developments in *Trichogramma* Production. Jour. Econ. Ent. XXIII., p. 837, Geneva, N.Y., October, 1930.

Fowler, R., 1927. (R.A.E. XVI., p. 285.) Further Investigations into Codling Moth Control. Second Report on Experiments carried out at Blackwood Experiment Orchard. Jour. Dept. S. Aust., XXXI., p. 480, Adelaide, Dec., 1927.

French, Jr., C., 1913. (R.A.E. II., p. 117.) Insect Pests of the Potato. Jour. Dept. Agric. Vic. XI., p. 729, Melb., Dec., 1913.

——., 1915. (R.A.E. IV., p. 254.) The Potato Moth *Phthorimæa operculella* Zeller (*Lita solanella* Bois.); Recent Spraying Experiments in Gippsland. Jour. Dept. Agric. Vic., XIII., p. 614, Melbourne, October, 1915.

Fullaway, D. T., 1914. (R.A.E. II., p. 629.) Tobacco Insects in Hawaii. Hawaii Agric. Expt. Sta., Honolulu, Bull. No. 34, May, 1914

Fulmek, L., 1923. (R.A.E. XI., p. 466.) De eieren van de voor tabak schadelijke vlinders in Deli. Bull. Deli Proeft., Medan, 1923. (With summary in German.)

Ghesquiere, J., 1923. (R.A.E. XI., p. 200.) La teigne de la pomme de terra au Congo Belge. Ann. Gembloux XXIX., p. 38, Brussels, February, 1923.

Glen, P. A., 1918. Codling Moth Investigations of the State Entomologist's Office. Bulletin Illinois Natural History Survey, Vol. 14, Article VII.

Graf, J. E., 1917. (R.A.E. V., p. 433.) The Potato Tuber Moth. U.S.D.A., Bull. No. 427, Washington, D.C., February, 1917.

Husian, M. A., 1926. (R.A.E. XV., p. 173.) Report of the Imperial Entomologist. Sci. Repts. Agric. Res. Inst., Pusa, 1925-26.

Jack, R. W., 1913. (R.A.E. I., p. 287.) Insect Pests of Tobacco in Southern Rhodesia. Dept. Agric. Rhodesia, Bull. No. 140 (N.D.), Salisbury, 1913.

——., 1927. (R.A.E. XVI., p. 247.) Tobacco Pests of Rhodesia. Rhodesia Agric. Jour. XXIV., p. 1235, Salisbury, December, 1927 (also as Bull. 665, Salisbury, 1928).

——., 1929. (R.A.E. XVII., p. 605.) Report of the Chief Entomologist for the year 1928. Rep. Secy. Dept. Agric. S. Rhodesia, 1928, p. 39, Salisbury, 1929.

Keuchenius, P. E., 1915. (R.A.E. IV., p. 79.) Waarnemingen over Zeikten en Plagen bij Tabak. (Tweede Serie.) (1) *Opatrum depressum* F.; (2) *Gnorimoschema heliopa* Low.; (3) De Tabaksmot, een nieuwe en ernstige plaag voor gefermenteerde tabak. Med. Besoekisch Proefst., No. 9 (sine loco), 1915.

Kirk, T. W., 1894. Potato Moth, Potato Tuber Moth, Potato Grub (*Lita solanella*). N.Z. Dept. Agric. Leaflets for Farmers, No. 16, Wellington, 1894.

Langford, G. S., and Cory, E. N., 1932. (R.A.E. XX., p. 522.) Observations on the Potato Tuber Moth. Jour. Econ. Ent., XXV., p. 625, Geneva, N.Y., June, 1932.

Lower, Oswald B., 1900. Proceedings of the Linnean Society of N.S.W. Vol. 25, 1900, pp. 417-8, Sydney, 1901.

Mandelson, L. F., 1933. Additional Recommendations for the Control of Blue Mould of Tobacco. Q. Agric. Jour. XL., Pt. 6, p. 470, Brisbane, December, 1933.

Miller, D., 1918. (R.A.E. VII., p. 49.) The Economic Bearing of Hover Flies. N.Z. Jour. Agric. XVII., p. 129, Wellington, September, 1918.

Morgan, A. C., and Crumb, S. E., 1914. (R.A.E. II., p. 280) The Tobacco Splitworm. Bull. U.S. Dept. Agric., No. 59, Washington, D.C., January, 1914.

Muesebeck, C. F. W., 1920. (R.A.E. IX., p. 169.) A Revision of the North American Species of Ichneumon-flies belonging to the Genus Apanteles. Proc. U.S. Nat. Mus., LVIII., No. 2349, p. 483, Washington, D.C., 1921.

——., 1922. (R.A.E. X., p. 551.) A Revision of the North American Ichneumon-flies belonging to the Sub-families Neoneurinæ and Microgasterinæ. Proc. U.S. Nat. Mus., LXI., Art 15, No. 2436, Washington, 1922.

Newman, L. J., 1920. (R.A.E. IX., p. 260.) Potato Insect Pests. W.A. Dept. Agric. Bull. 72, Perth, 1920.

——., 1922 (R.A.E. X., p. 630.) Report of the Economic Entomologist. W.A. Dept. Agric. Ann. Rept., 1921-1922, p. 28, Perth, 1922.

Petersen, Alvah, 1925. (R.A.E. XIII., p. 252.) A Bait which attracts the Oriental Peach Moth (*Laspeyresia molesta* Busk). Jour. Econ. Ent., XVIII., p. 181, Geneva, N.Y., February, 1925.

——., 1927. (R.A.E. XV., p. 260.) Some Baits more attractive to the Oriental Peach Moth than Blackstrap Molasses. Jour. Econ. Ent., XX., p. 174, Geneva, N.Y., February, 1927.

Petersen, Alvah, and Haeussler, G. J., 1930. (R.A.E. XVIII., p. 585.) Life History of the Oriental Peach Moth at Riverton, N.J., in Relation to Temperature. U.S.D.A. Tech Bull., No. 183, Washington, D.C., June, 1930.

Pickard, F., 1913 (*a*). (R.A.E. I., p. 166.) Sur la parthenogenese et le determinisme de la ponte chez la Teigne des Pommes-de-terre (*Phthorimæa operculella* Z.). C.R. Acad. Sci., CLVI., p. 1097, Paris, 1913.

——., (*b*). (R.A.E. II., p. 400.) La teigne des pommes de terre. Ann. du Service des Epiphyties (1912), p. 106, Paris, 1913.

Poos, F. W., and Peters, H. S., 1927. (R.A.E. XVI., p. 438.) The Potato Tuber Worm. Bull. Virginia Truck Expt. Sta., No. 61, p. 597, Norfolk, Virginia, October, 1927.

Sagot-Lesage, M., 1923. (R.A.E. XII., p. 38.) Un Parasite de la Pomme de Terre. Rev. Hortic. de l'Algerie, XXVII., p. 215, Algiers, December, 1923.

Sclupp, W. F., 1917. (R.A.E. VI., p. 360.) The Potato Tuber Moth. Union S.A. Dept. Agric., Bull. No. 4, Pretoria, 1917.

Smith, J H., 1932. (R.A.E. XXI., p. 63.) The Tobacco Stem Borer. Q. Agric. Jour., XXXVIII., Pt. 4, p. 331, Brisbane, 1932.

Spencer, H., and Strong, W. O., 1925. (R.A.E. XIV., p 471.) The Potato Tuber Worm. History in Virginia. Bull. Virginia Truck Expt. Sta., No. 53, p. 419, Norfolk, Virginia, October, 1925.

Stoward, F., 1913. (R.A.E. I., p. 377.) The Insensitivity of the Life-forms of the Potato Moth to Various Poisons. Rept. A.A.A.S., Melb., 1913.

Taylor, H W., 1917. (R.A.E. VI., p. 152.) Tobacco Seed-beds. Union S.A. Dept. Agric., Bull. No. 7, Pretoria, 1917.

Trouvelot, B., 1921. (R.A.E. X., p. 86.) Observations biologiques sur l'Habrobracon johanseni Vier. C.R. Soc. Biol., LXXXV., p. 1022, Paris, December, 1921.

——., 1922. (R.A.E. X., p. 393.) La Teigne de la Pomme de Terre. Moyens de Lutte. Acclimatation d'un Auxiliare. Rev. Hist. Nat. Appl. III., p. 125, Paris, 1922.

——., 1924. (R.A.E. XIII., p. 155.) Recherches de biologie appliquee sur la teigne des pommes de terre et ses Insects entomophages en agriculture. Etude des conditions de pullulation des insects. Ann. Epiphyties, X., p. 1-132, Paris, 1924.

Underhill, G. W., 1926. (R.A.E. XVI., p. 20.) Studies on the Potato Tuber Moth During the Winter of 1925-26. Bull. Virginia Truck Expt. Sta., No. 251, Blacksburg, Virginia, August, 1926.

Van der Goot, P., 1924. (R.A.E. XII., p. 551.) Overzicht der voornaamste zeikten van het aardappelgewas op Java. Inst. Plantenziekten, Bull. 18, Buitenzorg, 1924.

Weddell, J. A., 1934. Lead Arsenate *v.* Leaf Miner on Tobacco. Unpublished Report, Q. Dept. Agric. & Stock, Brisbane, 1934.

Wilkinson, D. S., 1926. (R.A.E. XIV., p. 370.) Entomological Notes. Cyprus Agric. Jl., XXI., p. 47, Nicosia, April, 1926.

——., 1929. (R.A.E. XVII., p. 506.) New Parasitic Hymenoptera and Notes on Other Species. Bull. Ent. Res. XX., p. 103, London, May, 1929.

——., 1932. (R.A.E. XX., p. 118.) Some New Species of Chelonella (Hym. Brac.). Stylops I., Pt.1, p. 6, London, January, 1932.

Yothers, M. A., 1927. (R.A.E. XVI., p. 80.) Summary of Three Years' Tests of Trap Baits for capturing the Codling Moth. Jour. Econ. Ent., XX., p. 567, Geneva, N.Y., August, 1927.

——., 1930 (*a*). (R.A.E. XVIII., p. 574.) Summary of Results obtained with Trap Baits in capturing the Codling Moth in 1927. Jour. Econ. Ent., XXIII., p. 576, Geneva, N.Y., June, 1930.

——., 1930 (*b*). (R.A.E. XIX., p. 210.) Further Results with Trap Baits for capturing the Codling Moth. Jour. Econ. Ent., XXIII., p. 923, Geneva, N.Y., December, 1930.

Fat Lamb Raising

BLUESTONE AND NICOTINE SULPHATE DRENCH FOR WORMS IN SHEEP.

By F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

TRICHOSTRONGYLOSIS or "black scours" is a disease of sheep, more especially of young stock, associated with infestation by very small species of worms known as the small trichostrongyles or hair worms. These tiny worms may be present in thousands in the small intestine where they occur buried in the mucous of the intestine wall. They are very difficult to see with the naked eye and appear as reddish streaks about a quarter of an inch in length, being most numerous in about the first 15 feet of the intestine. Drenches such as bluestone, arsenic, and carbontetrachloride, which are very efficient against the barber's pole worm in the fourth stomach, have little effect on these hair worms, and in the past these could be controlled only by preventive measures.

Recent work by the McMaster Animal Health Laboratory, Sydney, has shown, however, that if nicotine sulphate is combined with bluestone, the majority of the hair worms will be removed.

Formula—

Bluestone	1 lb.
Nicotine sulphate	16 fluid oz.
Water	5 gallons.

Dose—

Sheep, 18 months and older	2 fluid oz.
Sheep, 12 to 18 months	1½ fluid oz.
Sheep, 4 to 12 months	1 fluid oz.
Sheep, under 4 months	½ fluid oz.

Anyone who has had experience with the ordinary bluestone drench for barber's pole worm infestation, where the adult dose is also 2 fluid oz., will have observed that one of the disadvantages of this drench is the bulkiness of the dose, which slows up treatment considerably. The

McMaster Laboratory has shown, however, that with the bluestone and nicotine sulphate drench the dose may be greatly reduced in bulk without impairing the efficiency of the treatment or harming the sheep.

Formula—

Bluestone	1 lb.
Nicotine sulphate	16 fluid oz.
Water	2 gallons.

Dose—

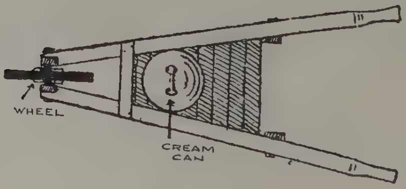
18 months and older	20 cubic centimetres.
12 to 18 months	15 cubic centimetres.
8 to 12 months	10 cubic centimetres.
4 to 8 months	8 cubic centimetres.
Under 4 months	5 cubic centimetres.

No starvation is required either before or after treatment.

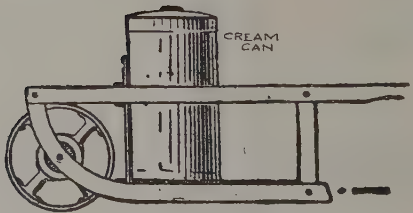
The bluestone should be of good quality and should be kept in a closed container. The required amount (1 lb.) is dissolved in hot water, and the nicotine sulphate is added when the solution is cool. The quantity of nicotine sulphate is measured in fluid ounces not in ounces by weight, and the sample used should contain 40 per cent. nicotine. Only earthenware or enamel vessels should be used for mixing this drench as bluestone reacts with metal surfaces, destroying the vessel and impairing the efficiency of the preparation.

This bluestone and nicotine drench is very effective against the barber's pole worm and tape worms as well.

BARROW FOR CREAM CANS.



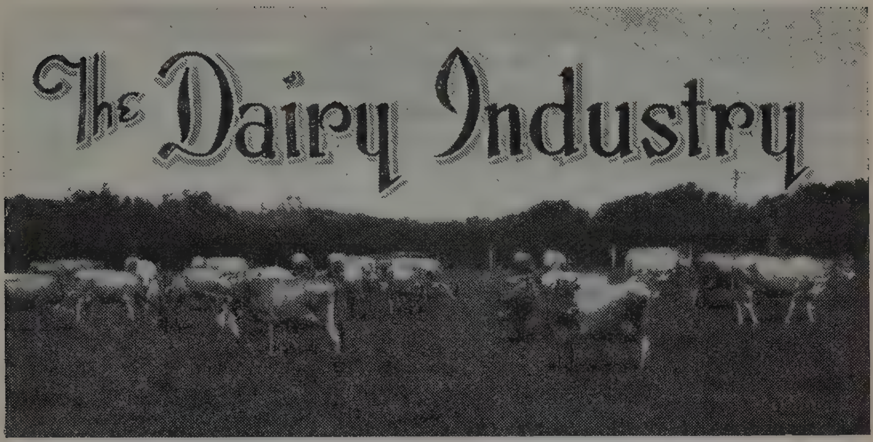
TOP VIEW.



SIDE VIEW.

PLATE 108.

These sketches show how a very useful barrow is built. It is invaluable when cans have to be taken downhill and the ground is wet and slippery. Let the load rest on the two bottom runners, which act like a sledge.



FERMENTED AND GASSY MILK AND CREAM.

By E. B. RICE, Dairy Research Laboratory.

THE warmer months of the year bring in their train many defects in milk and cream of which none is of more frequent occurrence than that variously described as gassy, fermented, fruity, and yeasty. The defect is always associated with a copious evolution of the gas carbon dioxide, which is derived from the chemical decomposition of the milk sugar by certain organisms. It is especially noticeable during a period when the days and nights are both hot. In sour cream gas formation is so vigorous at times that the lids of the cans are forced up in transit, and loss results from the cream overflowing from the can. Factors which materially contribute to any of these conditions are careless methods of production and handling, high holding temperatures, and infrequency of delivery to the factory. Cream which is affected by any of these ferments is always graded down upon arrival on the factory platform, as it is only fit for manufacture into inferior grade butter. Although pasteurisation destroys the offending organisms, the by-products resulting from their action on the cream are not removed by this process, and carry the taint through to the finished butter.

Milk contaminated by organisms responsible for gassiness, fruity flavours, or yeastiness is much dreaded by the cheesemaker. In spite of the special methods which have to be adopted during the processing of such milk, a cheese of defective flavour always results. The comparatively high temperatures in the latter stages of cheese making are ideal for the injurious organisms, which suppress the activities of the desirable lactic acid bacteria. Pasteurisation of cheese milk assists to overcome the difficulties of manufacture and the extent of the depreciation in quality of the cheese, but it is not a remedy for the treatment of milk which has been carelessly produced. Occasional testing of the milk of all suppliers by the methylene blue reduction test, or the Wisconsin curd test in suspected cases, will enable the detection of the suppliers whose milk is at fault.

Another source of the organisms may be the "starter" itself. "Starters" which have been propagated for long periods under the usual factory procedure in this State may become contaminated with gas-forming organisms. Their continued use is then fraught with considerable risk, for, in addition to the desired lactic acid bacteria the cheese milk is seeded with germs which have a damaging influence on quality. Any starter suspected of containing foreign organisms should be immediately abandoned.

Causative Organisms.

Many micro-organisms are capable of producing a gassy fermentation, but those responsible for the defects referred to under farm and factory conditions may be classed as under:—

1. Coli-aerogenes group of bacteria.
2. Yeasts.
3. Butyric acid bacteria.

Coli-aerogenes Bacteria.—Of this group, the *B. coli,* as their name implies, are derived from the colon (large intestine) of animals; hence their presence in a sample is indicative of pollution, either directly or indirectly, from excremental matter. They may reach the milk or cream by many directions, such as, small particles of dung falling from the animal's body into the pail during milking, or being blown from the floor of the bails into the pail; dust becoming attached to the coat of the animal from lying where dung has accumulated or also being blown in from the bails; the use for washing-up purposes of water from places into which animals have waded. Even if polluted water is not used for cleaning utensils, cows watering in it stir up muddy liquid which is splashed on to their coats. The bacteria later find their way into the milk pail.

Apart from the undesirable fermentation which takes place, the presence of *B. coli* is regarded with suspicion on account of its close association with certain disease-producing germs.

Bacterium aerogenes, on the other hand, is comparatively rare in the intestines, and its habitat is generally the soil, on cultivated plants, grain, water from streams draining cultivated fields, &c. It produces a larger volume of gas than does *B. coli,* along with a more objectionable odour. Contamination with these bacteria arises from dust, unsterile utensils, unsterile straining cloths, and impure water.

The optimum temperature for the growth of both species is blood heat (98·6 deg. Fahr.). The so-called "fruity" flavours in cheese originate from the use of milk contaminated by *Coli-aerogenese* bacteria. While milk and cream are held at low temperatures these germs are kept in check, and the acid developed from the normal souring leads to their destruction.

Shelton drew attention to a case in New South Wales where the milk of one herd, which had been accustomed to lying in the shade of a tree where manure had accumulated, upset the whole batch of milk at a factory. When this contaminating influence was removed by cleaning up the yard no further trouble was experienced.

Yeasts.—Certain varieties of yeasts can be obtained from almost any sample of dairy produce, but those which are responsible for any of the defects mentioned belong to a class which is able to ferment milk sugar with the production of gas and a yeasty odour, this odour being due to small quantities of alcohol formed from the milk sugar. Owing to their slower growth than bacteria, deterioration due to yeasts is usually not evident until bacterial activity has almost ceased. The bacteria, and particularly the lactic acid bacteria, assume control of the primary fermentation of fresh milk and cream. However, when the acidity reaches a concentration of about 0·6 per cent. the bacteria gradually die out and, provided suitable temperature requirements are met, the yeasts which had remained dormant up to this stage begin their multiplication. They are able to flourish in sour cream and milk, as, in contrast to bacteria, they can tolerate fairly large quantities of acid. Thus the occurrence of yeastiness in the warmer weather is explained partly by the quick development of acid, which then inhibits bacteria, and partly by the higher temperatures which favour these organisms. There

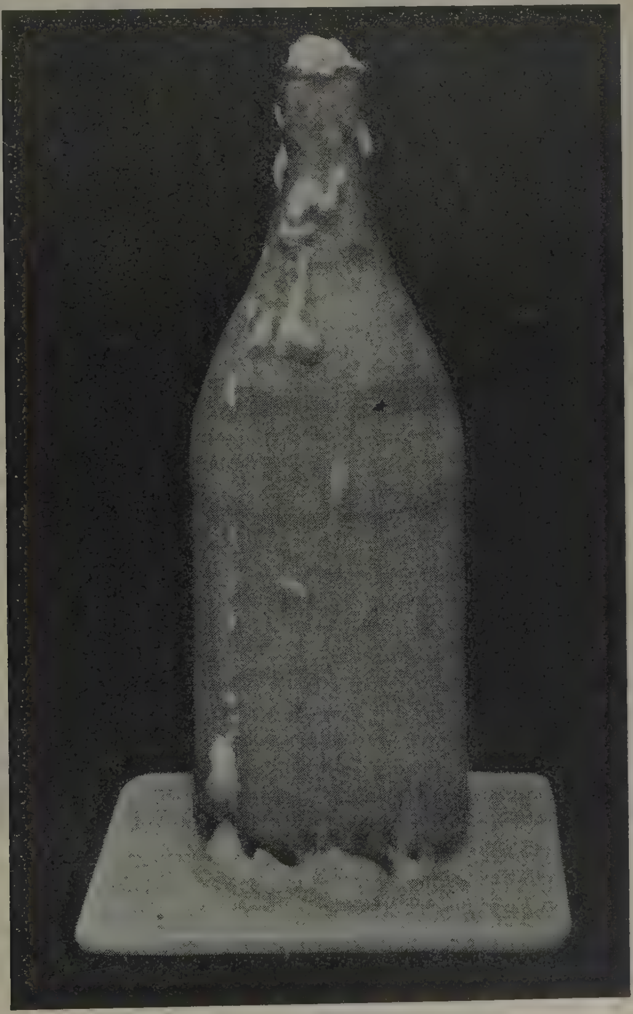


PLATE 109.
Yeasty cream overflowing container.

may be just as many yeasts present in milk and cream produced in the cooler months, but climatic conditions prevent them from increasing sufficiently to deteriorate the article. The characteristic foaming of yeasty cream is due to the escape of the gas bubbles being hindered by the thick, sour cream.

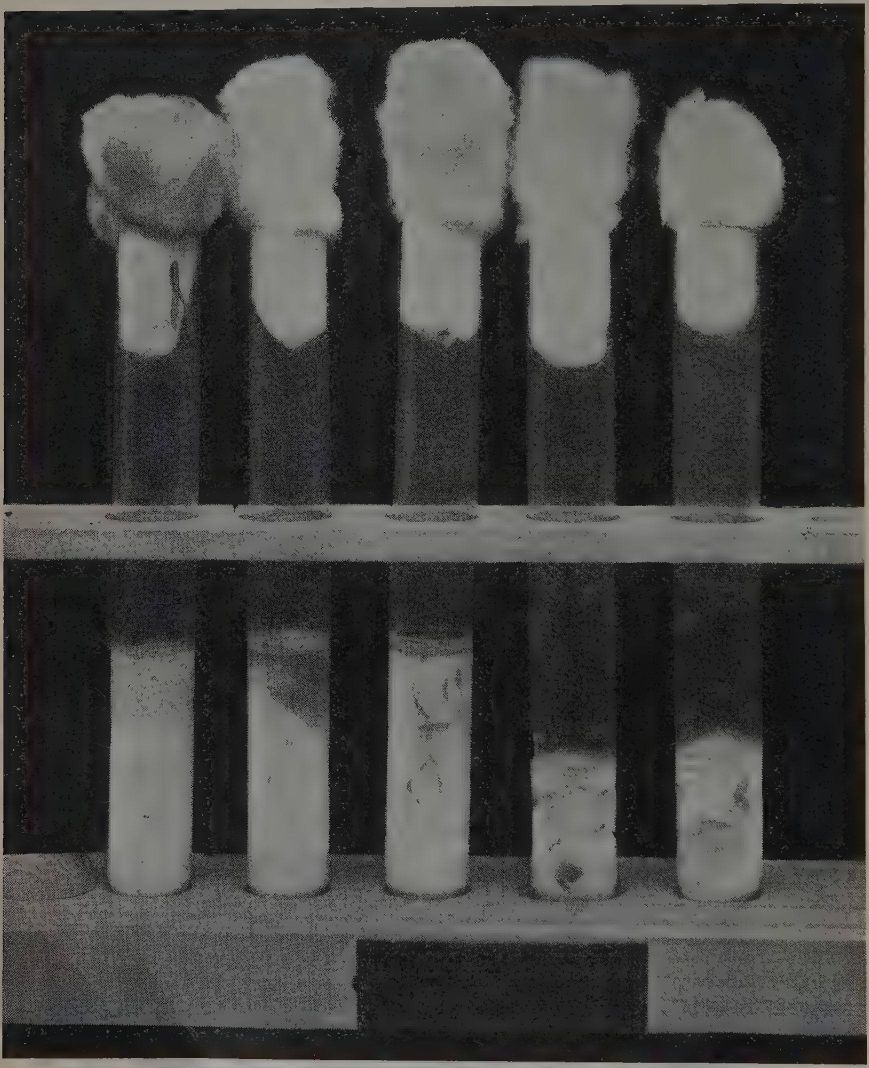


PLATE 110.

Tube on extreme left shows normal milk curd. The other tubes contain type of curds showing gas formation.

The source of origin of the yeasts gaining access to the milk is usually on dust from feeding stuffs or the bails.

Butyric Acid Bacteria.—These bacteria are known as anærobes on account of not growing in the presence of air. They are abundant in the dung of animals and soil, the common mode of infection of dairy products being by manurial contamination. In market milk, or in fresh or sour cream, they are not usually significant, their growth being retarded by other germs, and they also soon die out in the unsuitable environment. Occasional stirring assists in providing these unfavourable conditions. They form bodies known as spores, which are resistant to heat, and so in pasteurised milk and tinned cream and condensed milk they sometimes cause gassiness. They can also cause the "blowing" of cheese.

Control Measures.

The gas-forming microbes belong to several classes which are widespread in nature. The care taken in the production determines largely the number which will be present when milk or cream is placed in the dairy. This in turn influences the speed with which gassiness will develop in the event of exposure to unfavorable temperatures for any length of time. The greater the initial contamination the sooner will "off" flavours appear and the more serious will be their nature.

The main steps in control on the farm in order to exclude the gas-forming organisms as far as possible are—

1. Thoroughly clean all utensils.
2. Prevent contamination from dust from the animals' bodies, floor of the bails, &c.
3. Keep flies, which are carriers of these germs, out of the cream.
4. Avoid the use of impure water for the cleaning of utensils.

In Queensland, where average summer temperatures approach the optimum for the growth of the causal organisms, it is also necessary to take steps to prevent their rapid numerical increase. To accomplish this, attention needs to be given to the undermentioned points:—

1. Cool cream as far as possible.
2. Stir at intervals throughout the day.
3. Keep in a cool, well-ventilated dairy.
4. Deliver to factory as often as possible in the summer months.

* * *

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Progress of the Pig Industry

The Pig Farm.

ACCOMMODATION AND EQUIPMENT.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

These notes, which were published in the Journal for June, 1935, are reprinted, after revision, in response to numerous requests from pig-raisers and others contemplating entering the pig-raising industry.—Ed.

IN providing accommodation for his pigs, the farmer must consider the health and comfort of his stock and plan to prevent disease as far as practicable; he must also consider his system of feeding and management and bear in mind the class of pigs that is required by the pork and bacon trades.

During recent years the general demand has changed towards leaner meat, and pig-raisers are now endeavouring to produce pork and bacon pigs which have an abundance of lean meat and a minimum of fat; this, of course, necessitates a change of methods in breeding, feeding, and management.

Investigations into disease in pigs have shown that certain rules in sanitation regarding pig accommodation will, if carried out, control most of the serious troubles which occur in pigs, particularly infestation by internal parasites.

Although certain features must be considered for the pig's health and comfort, one must also consider the cost of providing pig accommodation, for pig-raising is a business, and if too much capital is expended on the insurance of health of the stock, the additional income may not give sufficient return on the capital invested. Fortunately, under the mild climatic conditions which prevail in Queensland, ample accommodation may be provided for pigs at a comparatively low cost and the outlay on good piggery equipment is usually well repaid.

The class of accommodation required for any piggery depends upon the system of pig-raising to be carried out. There are several fairly well-defined systems in Queensland. The coastal dairy farmer who keeps pigs to utilise separated milk usually has very little cultivation and rarely grows grain, depending on the separated milk, perhaps some sweet potatoes and arrowroot, together with some pasture, to feed his pigs. Under these conditions the pigs are usually kept fairly convenient to the dairy to reduce the labour required in conveying milk to the pigs, and, if practicable, the pigs are fed at a place lower than the dairy, the milk being conveyed from the separator room to the piggery by means of an open gutter pipe. On this class of farm pigs are usually given access to grazing on permanent pastures.

The mixed farmer who combines dairying with crop-growing keeps pigs to use his milk by-products and a portion of his grain, root crops, lucerne, and pumpkins. He studies the market prices of pigs and of the various crops to determine when to market his crops direct and when to sell them by way of the pigs. Under these conditions more pigs are kept per cow than where milk is the main source of food supply. The pig accommodation on this type of farm should be such that the pigs can be turned on to portions of the cultivation land to enable them to harvest some of their own food when desired.

PLATE 111.

Berkshire sows being kept economically on lucerne. Their movable shelter shed may be seen in the background.

Pig-raisers who do not use milk, but substitute meat meal in the pig's ration and grow grain, lucerne, and other crops especially for pigs, have a different proposition again and should aim at having all their paddocks suitable for holding pigs.

Pig farmers who run large numbers of pigs on small areas of land adjacent to cities or towns or near dairy factories, and feed their pigs on table refuse or factory by-products, usually keep their pigs on a different system to farmers who have fairly large farms and produce most of their pig food.

Bearing in mind the most important feature of pig accommodation —namely, sanitation—there can be only two clearly defined systems of keeping pigs which are completely satisfactory; one is the grazing system, wherein pigs are kept on fresh pasture or crop land which is either rested or cultivated and grazed in rotation; the other is the intensive system in which the pigs are kept on impervious floors, such as concrete, which are properly drained and regularly cleansed. In both of these systems the object should be to keep the pigs on clean ground or on a clean floor, for a good deal of the infection to which pigs are subject lurks on the ground or floor of pig pens which are not rested or are inconvenient to cleanse.

Where there is a sufficient area of good grazing land or cultivation land the grazing system has many advantages, and should be adopted either entirely or in combination with the intensive system, which is often convenient for sows with young litters of pigs. If sufficient paddocks can be cropped for the pigs to do the harvesting, the paddocks being ploughed a couple of times each year, infection will be kept at a minimum, the pigs will receive benefit from the exercise gained in grazing or harvesting their own food, a good deal of labour is saved in the harvesting of the crop, and the fertility of the land benefits.

PLATE 112.
These prime baconers were "finished" under paddock conditions, never having been penned.

On grazing land where cultivation is not practicable it is necessary to have sufficient paddocks of ample area to keep them always well grassed and to enable the resting of the paddocks at frequent intervals. Pig paddocks should not be over-stocked so that they become bare, unless they can be cultivated or rested for several months. Even if pigs are paddocked as suggested, the ground near the troughs will become "pig sick" after a time, and it is most desirable that such equipment should be movable. Sheds of convenient size—say, with a floor space of 8 ft. square—should be provided in the paddocks to shelter the pigs from the extremes of the weather, and these sheds should be built on skids to allow of their easy transport about the paddock or from one paddock to another. Food troughs and platforms, self-feeders, and water fountains should also be mounted on skids for easy transport.

With movable equipment and sufficient paddocks, there is no necessity for cleaning up with broom and shovel, and where pigs are kept on the grazing system the whole piggery is found to be free of noxious odours which are usually associated with small pen piggeries; these features make pig-raising a much more congenial undertaking when the grazing system is adopted.

When the intensive system of pig-raising is adopted, impervious floors and good drains are essential; a good supply of water and labour is also required to clean the pens daily. Intensive pens are necessarily small, and a portion of each pen is roofed to provide the pigs with shelter from the extremes of the weather. (*See* plan of intensive pig pens.)

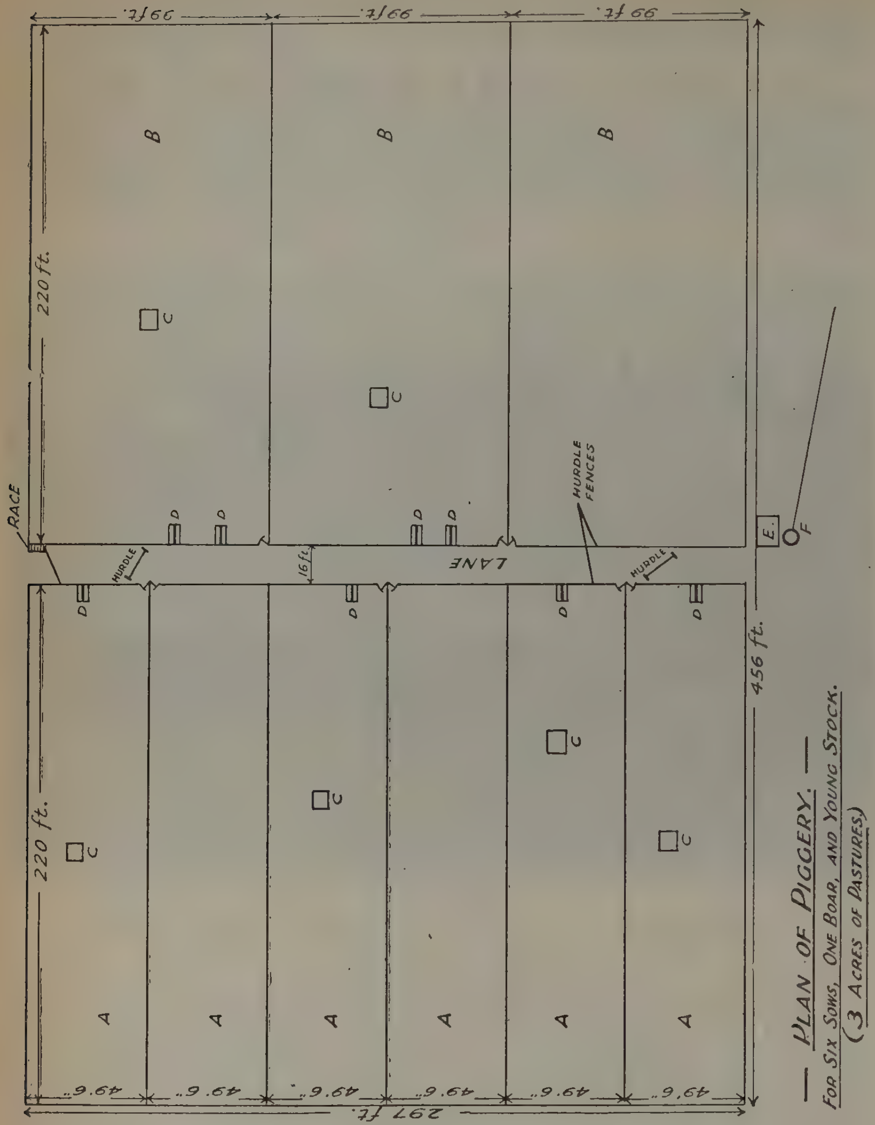
PLATE 113.
Intensive pig pens in use at the Animal Health Station, Yeerongpilly.

A Suggested Layout.

The plan of a piggery shown in Plate 114 suggests a layout which has proved very satisfactory where suitable cultivation or grazing land is available. This plan gives scope for cultivation and rotational grazing of paddocks with a view to providing a maximum of pasture for the pigs and control of disease and parasites. The lane in the centre of the runs with a loading race at one end and two movable hurdles provides ample facilities for drafting pigs.

The usual fencing should be replaced by movable hurdles at the ends of the runs adjoining the lane, so that when paddocks are being cultivated implements may work right to the end of the run, for it is this portion around the troughs which becomes most fouled.

It is not suggested that the pigs will obtain all their food from the 3 acres of grazing shown in the plan, and the grazing can only be expected to carry the pigs if other food, such as grain and milk or grain and meat meal, are provided in addition.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PLAN OF PIGGERY.—
FOR SIX SOWS, ONE BOAR, AND YOUNG STOCK.
(3 ACRES OF PASTURES.)

PLATE 114.

(*a*) Indicates paddocks of ¼ acre each for the use of dry sows, sows with litters, and the boar. At most times two of these paddocks could be under cultivation and later be grazed in rotation.

(*b*) Indicates paddocks of ½ acre each in extent to be used for growing pigs. As one paddock could usually be spared they can be cultivated and grazed in rotation.

Six movable sheds (*c*) should be sufficient shelter for the pigs, as these may be moved from one paddock to another as required.

Troughs built on movable platforms (*d*) will be found convenient if drawn against the fence and moved along as the surrounding ground becomes fouled.

(*e*) Shows the feed shed.

(*f*) Shows the milk tank connected by a line of open gutter pipe from the separator-room.

Where the correct type of pig is bred and feeding conditions are good, pigs may be kept in paddocks as suggested, from birth to slaughter, with excellent results.

On every farm where pigs are bred and reared a certain number of paddocks or pens are necessary so that pigs of various classes and ages may be kept separately. Breeding sows when dry should be run in a separate enclosure to other pigs, and in some cases it is even desirable to run the forward sows separate from the backward sows. Dry sows will secure the greatest part of their food requirement from good grazing and give best results when kept out in the open.

PLATE 115.

A section of a paddock piggery on Mr. W. F. Kajewski's property at Glencoe, showing the laneway, portions of paddocks, and movable shelter sheds. The long narrow paddocks are cropped regularly, and the system has been working satisfactorily for some years.

The best results are obtained when sows with young litters are kept in individual enclosures, and as it is rather difficult on large piggeries to give each sow and litter a separate paddock large enough to be cultivated, the intensive pen is often resorted to for sows and young litters. However, the sows and litters may be kept separately on pasture by providing each one with a hut to which are affixed three hurdles, making a small run; the whole unit should be movable so that the pigs can be put on to fresh pasture as each patch becomes fouled.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3-inch by 2-inch hardwood, 1-inch water piping, or saplings. It should be placed 9 inches above the floor and 7 inches from the walls.

Individual care is most necessary for sows and litters until the youngsters are about three weeks old, and after that time several sows with litters of approximately the same age may be run together with good results; however, no other pigs should be run with these. When the pigs are three or four weeks old they may be provided with a self-feeder containing grain or meals; the sows may also be given access to the self-feeder during this latter half of the lactation period, one feeder being sufficient for several sows and litters. When a feeder containing dry foods is providd, there should also be an accessible water supply, even if the pigs are given milk in addition. The young pigs do very well on this system of feeding, and when it is desired to wean them at eight weeks old the self-feeder should be enclosed with hurdles, which enable the young pigs to enter, but exclude the sows. The sow's food supply is so reduced that her milk flow ceases, and at the same time the young pigs take a larger amount of food from the trough, and thus weaning is achieved satisfactorily.

PLATE 116.

This litter of Middle Whites on Mr. H. O. Rees's farm, Maleny, appear to appreciate clean conditions.

After weaning the sows should be returned to the dry sows' paddock and the weaners should be graded into lots according to size.

From weaning time until marketing the growing pigs should be graded according to size into as many lots as convenient; under the grazing system, provided there is ample trough space to feed the pigs comfortably, two or three lots will be sufficient for the growing pigs; under the intensive system, pigs are usually kept in smaller lots.

Situation.

In selecting a site for intensive pig pens, consideration should be given to the aspect so as to provide shelter from the prevailing winds and to make the best use of the early morning sun as a disinfectant and deodoriser inside the sheds; thus a north-easterly aspect will usually be found the most suitable.

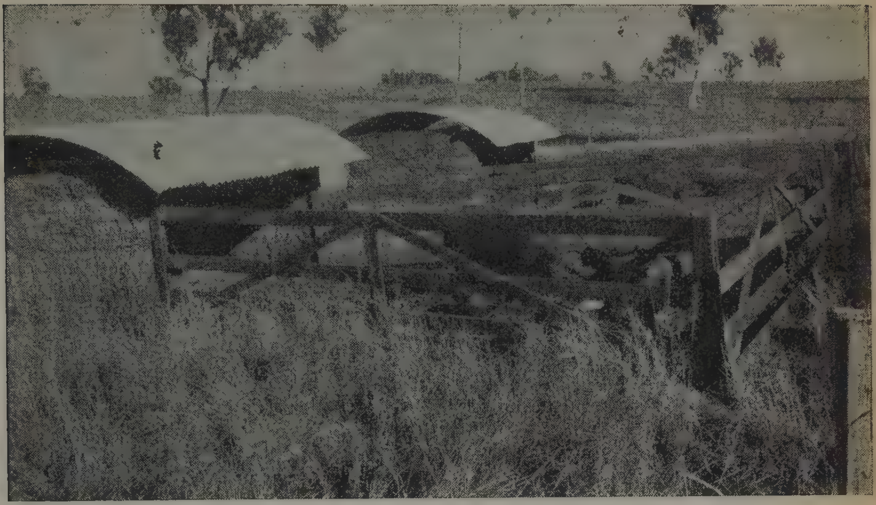


PLATE 117.

The system of pasturing sows and litters in movable huts with three hurdles attached to provide a yard is here illustrated in use at Mr. W. Dawson's farm, Woolooga.

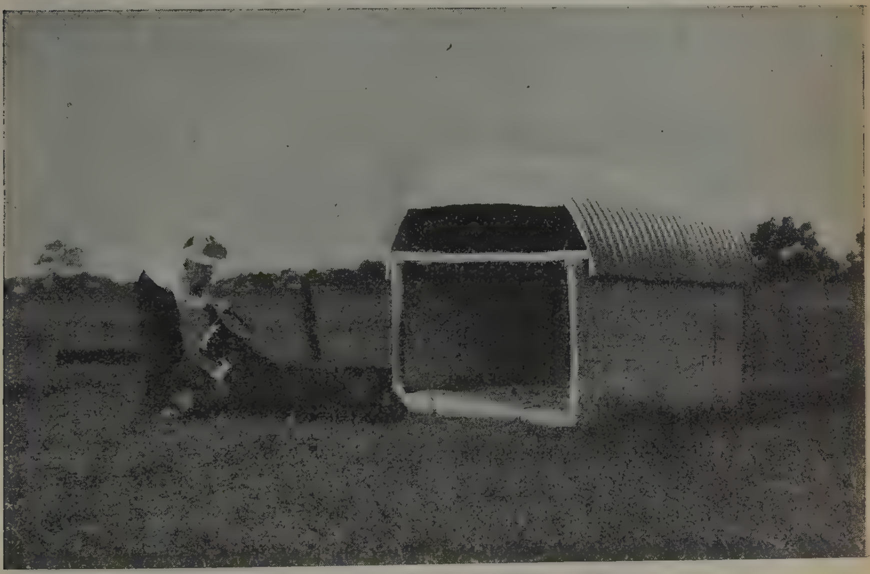
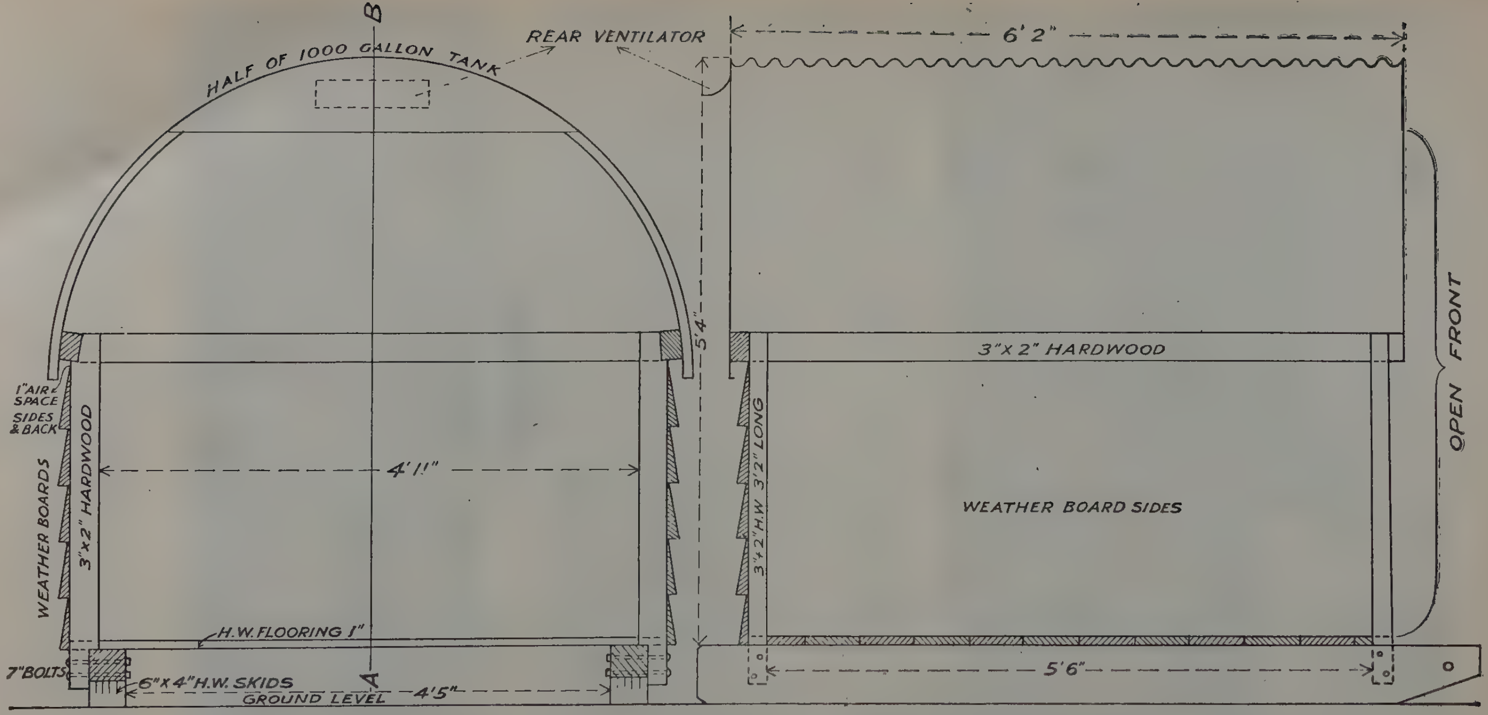


PLATE 118.

A half-tank movable shed in use at the St. Lucia Training Farm.


HALF OF 1000 GALLON TANK
REAR VENTILATOR
B
6' 2"
5'4"
1" AIR SPACE SIDES & BACK
WEATHER BOARDS
3"x2" HARDWOOD
4' 1"
H.W. FLOORING 1"
7" BOLTS
6"x4" H.W. SKIDS
GROUND LEVEL
A
4'5"
3"x2" HARDWOOD
3"+2" H.W 3'2" LONG
WEATHER BOARD SIDES
OPEN FRONT
5'6"

FRONT ELEVATION

SECTION THROUGH A.B.

PLATE 119.

Plan of a portable shelter shed, using half a water tank. Note skids on which this shed is constructed, providing for ready means of moving the house when required.

It is an advantage to have the pig paddocks on a slope to provide surface drainage. It is required by the Dairy Produce Act that the piggery should be situated at least 150 feet from dairy yards and buildings.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

Legislation.

Pig-raising is controlled by legislation under the Pig Industry Act, Dairy Produce Act, Diseases in Stock Act, and the Slaughtering Act, and the by-laws of city, municipal, and shire councils. While it is advisable, when about to construct or alter a piggery to consult the authorities concerned, through the district inspectors under the Acts, it might be stated here that the general purposes of the legislation in force are to provide for health and sanitation on the premises where pigs are kept. They do not aim at hindering progress or at increasing the cost of production.

PLATE 120.

The fence illustrated consists of "pig netting" of eight horizontals, 30 inches high in all. In addition, a barbed wire has been provided on the ground to prevent rooting, and another 6 inches above the netting to prevent jumping.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against disease.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time.

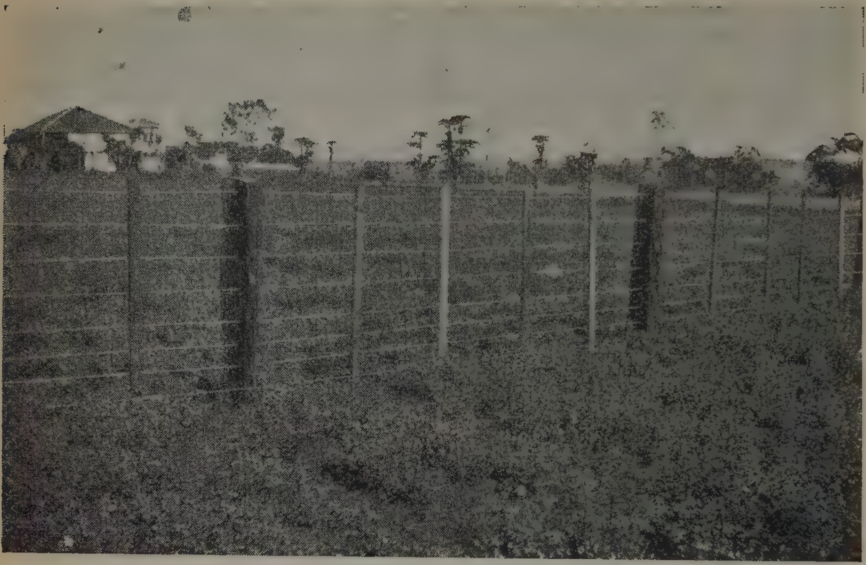


PLATE 121.

This fence has posts 10 feet apart, with four wooden droppers to a panel; seven plain wires run through the posts, and a barbed wire at the bottom prevents pigs rooting below the fence. If it is kept well strained, this type of fence is useful for all but very small pigs, and is cattle-proof.

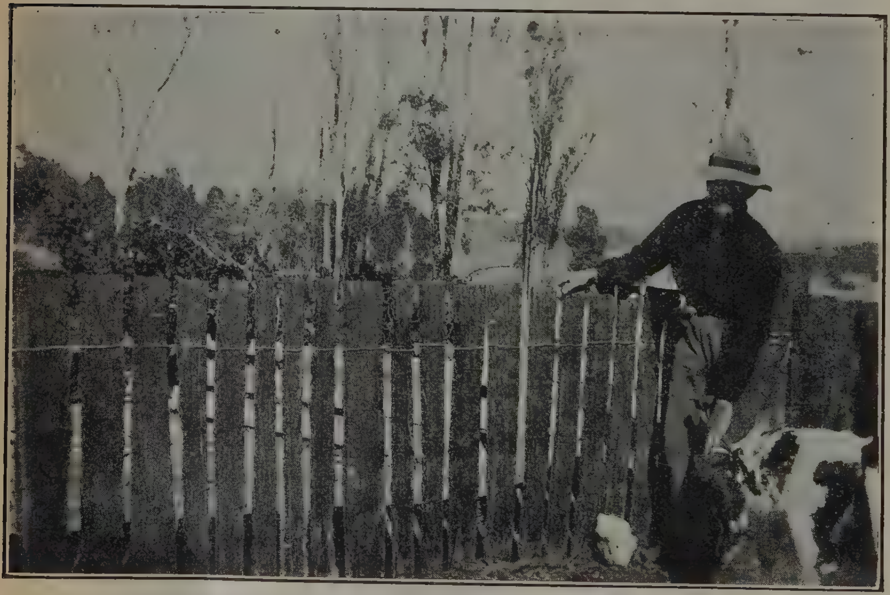


PLATE 122.

Where palings are readily available they can be used for pig fencing, as shown in this illustration.

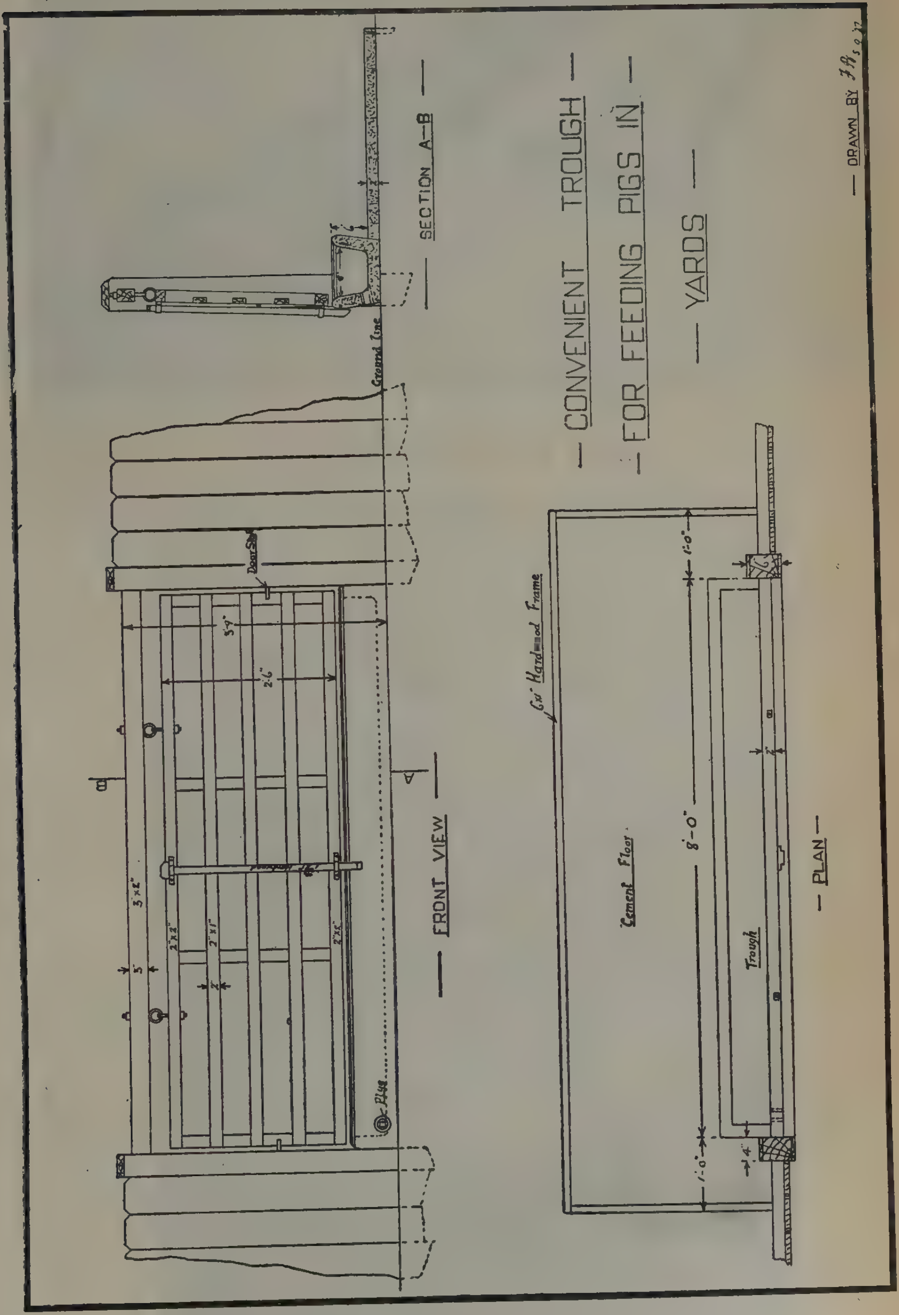

CONVENIENT TROUGH
FOR FEEDING PIGS IN
YARDS
SECTION A-B
FRONT VIEW
PLAN
DRAWN BY J.A.S.
Ground line
Door Stop
5'9"
2'6"
3"x2"
2"x2"
2"x1"
5"
2"
Plug
A
B
6"x" Hardwood Frame
Cement Floor
8'-0"
1'-0"
4"
Trough

Plate 123.

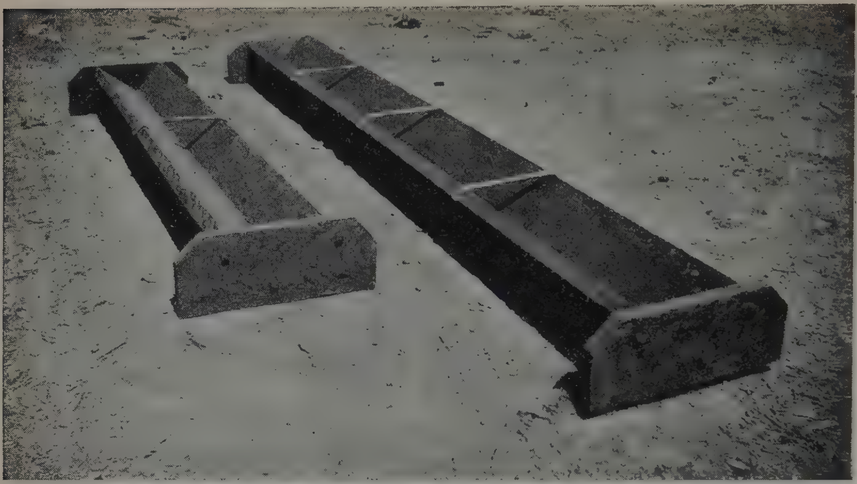


PLATE 124.
Handy V-shaped wooden troughs.

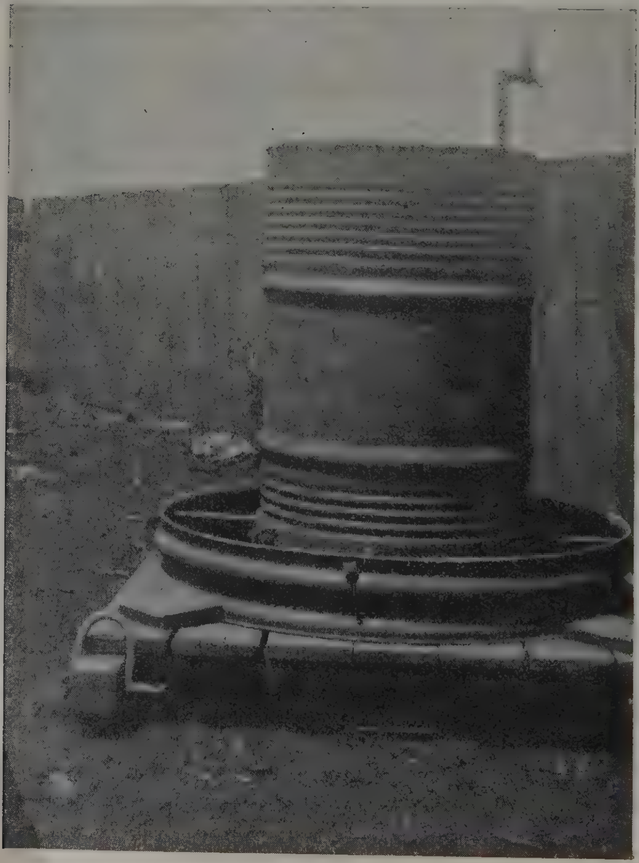


PLATE 125.
Automatic water fountain suitable for pigs in paddocks.

Plate 126 illustrates a type of self-feeder which has given satisfactory results in practice.

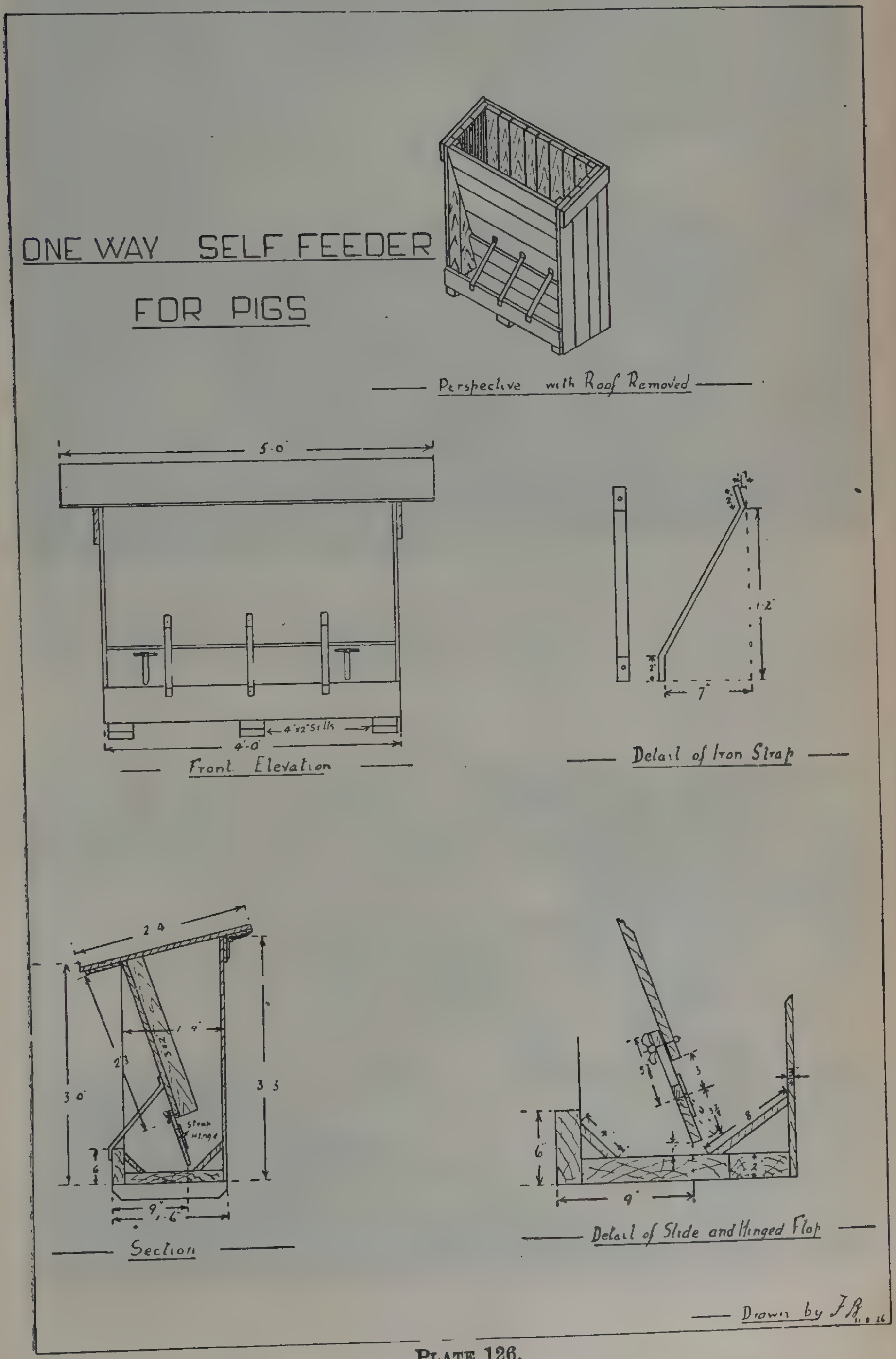

ONE WAY SELF FEEDER
FOR PIGS
Perspective with Roof Removed
5·0"
4"x2" Sills
4'-0"
Front Elevation
1·2"
7"
Detail of Iron Strap
2 4
1 4"
3"x2"
2 3
3 0"
3 3
Strap Hinge
6
9"
1-6"
Section
6"
9"
3
8
2
Detail of Slide and Hinged Flap
Drawn by J.R. 31.8.26

PLATE 126.

PLATE 127.

Baconers grown on the self-feeder, in which was placed a mixture containing 80 lb. maizemeal, 10 lb. lucerne chaff, and 10 lb. meatmeal. The pigs were also given unlimited supplies of drinking water.

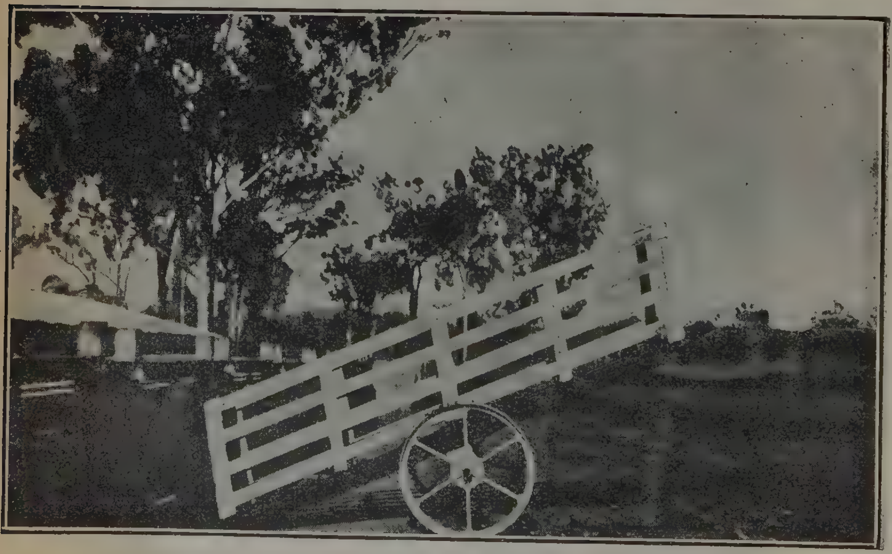


PLATE 128.

A useful portable loading race.

An average space of 10 in. should be allowed for each adult pig. The trough should have the capacity to hold a full feed for the pigs.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made, they should be of a size which allows of their being easily carried or hauled on to clean ground. With stationary troughs it is essential that they should be built on to a floor of concrete, brick, or timber to prevent the pigs from making an objectionable mud wallow beside the trough. The most serviceable troughs are of concrete, built into a concrete floor, as shown in Plate 123.

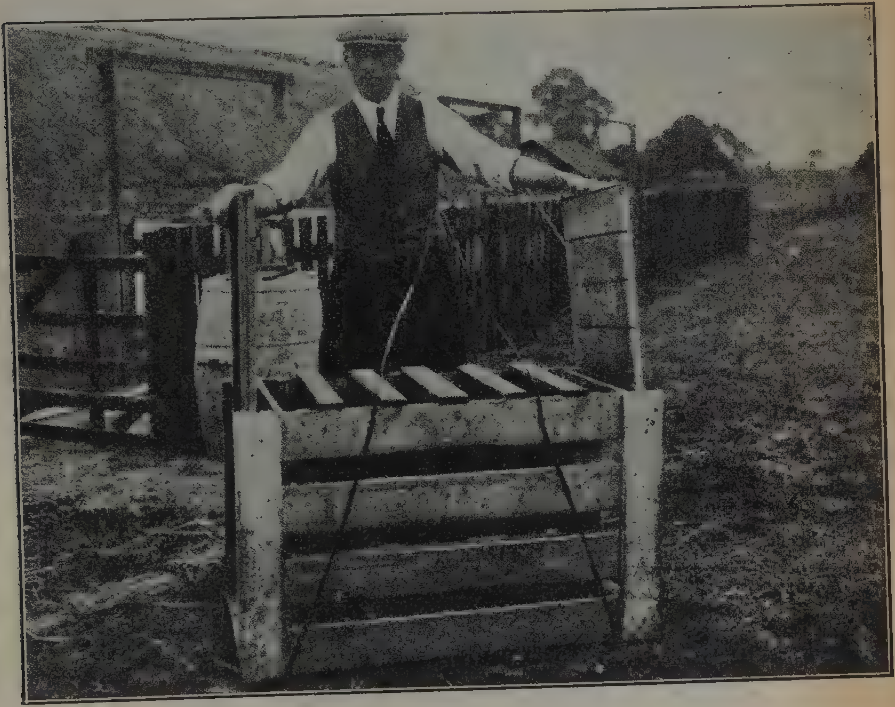


PLATE 129.

A wooden crate suitable for weighing pigs. Note the strong construction, "slide up" doors at both ends, and wires coming from bottom of crate to be attached to hook of the spring balance. Pine should be used in the construction of the crate so that its weight will not be too great.

The V-shaped wooden trough as illustrated in Plate 124 is very useful as a movable trough. This type of trough can be made of varying sizes to suit requirements. The timber must be tightly fitted to prevent leakages. A dressing of tar inside and out acts as a preservative of the wood and also makes it water-tight and more hygienic. Such a trough built on a movable wooden platform is very convenient for paddock use.

Automatic Waterer.

Plate 125 illustrates a watering device suitable for paddock use. A 40-gallon drum is set into a trough 6 inches deep, and the whole is fixed on to a slide. The drum has a ½-inch plug hole 1½ inches from its bottom, and a larger plug hole for filling at its top. The lower hole allows the water to flow out to a sufficient height to allow of the pigs drinking from the trough; and to fill the drum, the bottom hole is plugged and the top hole opened.

Self-feeding of pigs is as yet little practised in Australia, because pigs are kept chiefly to utilise by-products, such as separated milk, which are not readily adaptable to self-feeding; but when the price ratio of grain and pork is such as to make the pig a profitable means of disposing of grain, pig-raising must be considered from a somewhat different viewpoint.

The grain-grower who keeps pigs but has no milk foods can make good use of his grain by feeding it in combination with such foods as lucerne chaff and meatmeal, both of which are substitutes for separated milk in the pig's ration. Such feeds as these are adaptable to dry-feeding through a self-feeder, whereby the pigs have several days' food supply placed in the feeder and they are allowed to help themselves. Under certain conditions, self-feeding has many advantages and is worthy of trial.

ONE-WAY SELF-FEEDERS FOR PIGS—MATERIALS REQUIRED.

Members.	Number.	Length.		Size.	Material.
		Ft.	in.		
Skids	Three ..	1	6	4 in. x 2 in.	Hardwood
Trough	One	4	0	6 in. x 2 in.	Pine
Trough	One ..	3	10½	12 in. x 2 in.	Pine
Trough	One ..	3	10½	4 in. x 2 in.	Pine
Trough	One ..	3	10½	8 in. x ¾ in.	Pine
Trough	One ..	3	10½	4 in. x ¾ in.	Pine
Front Panels	Five ..	3	10½	6 in. x ¾ in. T. & G.	Pine
Front Panels	Two ..	2	3	3 in. x 2 in.	Pine
Sliding and hinged flaps	Two ..	3	10½	4 in. x ¾ in.	Pine
Ends and back	Twenty-four	3	3	6 in. x ¾ in. T. & G.	Pine
Ends and back	One ..	7	0	6 in. x ¾ in.	Pine
Top	Ten ..	2	4	6 in. x ¾ in. T. & G.	Pine
Top	Two ..	5	0	6 in. x ¾ in.	Pine

Hardware—Three 1-inch by ¼-inch iron straps.
Six 3-inch strap hinges.
Two 3-inch by ½-inch bolts with thumb nuts.
Nails, &c.

Shade.

Pigs should be provided with ample cool shade in hot summer months, either by planting shrubs or hedges or by building a framework of 3-in. by 2-in. hardwood and covering the top with bushes or thatching it with grass.

Weighing Pigs.

As pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price per lb. varies according to specified weight limits, it is important to the pig-raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

On account of pig-trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

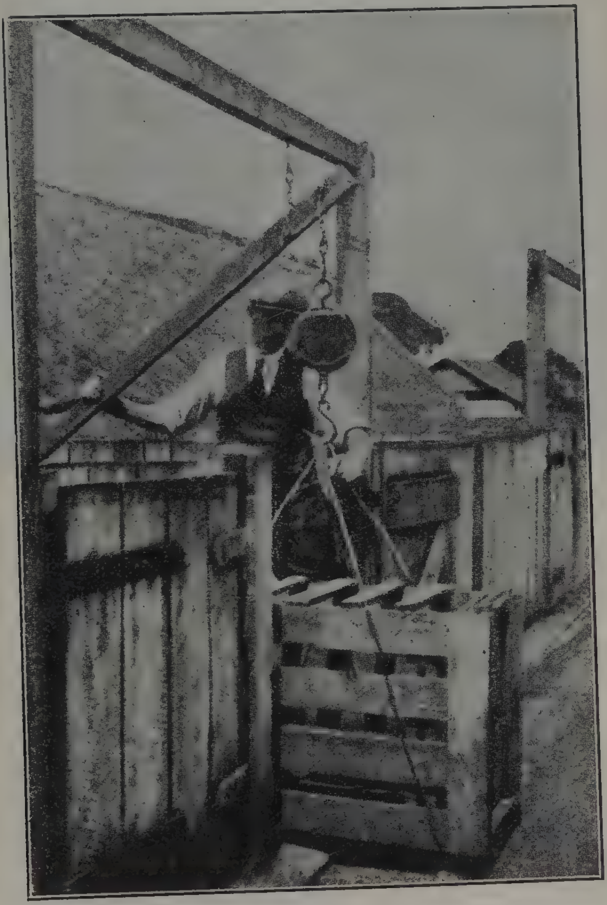


PLATE 130.

Crate in position, ready for use, with front door closed. Note the arrangement of the top beam, lever, and spring balance.

Even after years of practice, guessing the weights of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, for, with intelligent use, they soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

The weighing crate should be light yet strong; a convenient size for a crate to hold one bacon pig is 3 feet 6 inches long, 2 feet 6 inches high, and 1 foot 6 inches wide.

If the weighing crate is arranged in a race, the pigs can be brought from their pen, weighed, and then returned to the pen conveniently.

There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig-raisers.

PLATE 131.
A good feeding outfit in use on Mr. R. Turpin's pig farm, Lowood.

◆

MARKETING OF VEGETABLES—ADVANTAGES OF COLD STORAGE.

Cold storage is essential if fruit and vegetables are to be marketed with advantage, pointed out Mr. W. J. Williams, Superintendent of Markets, Sydney, at the recent Illawarra district conference of the Agricultural Bureau of New South Wales. In an address containing information concerning the storage of various primary products, the following facts were given with regard to vegetable crops:—

Potatoes and onions can be placed in cold storage to great advantage. For a long time they have been kept in common storage, where the loss is somewhere in the vicinity of 18 per cent., whereas when these products are kept in a controlled temperature the loss is rarely above 4 per cent. There is an added advantage that in common storage potatoes and onions sprout, whereas in cold storage this does not occur.

That this alone means a great saving in the weight will be readily understood; besides this, the potatoes come out of store fresh and without wrinkles, and it would be very difficult to detect them from fresh vegetables. Care must be taken, however, to see that the temperature is not too low. The right temperature is 35-38 deg. with 80-84 per cent. humidity. If the temperature is too low, then the starch is converted into sugar, and the potatoes become very sweet. Potatoes can be stored for seed purposes with great advantage.

Vegetables, such as lettuce, cauliflowers, celery, peas, and beans can be kept in cold storage for a period of four to six weeks. If, however, it is desired to keep beans and peas for any lengthy period, they should be "quick frozen."

Tomatoes can be stored when ripe for a period of three weeks and green for a period of a month, the best temperature being 45 degrees with 85 per cent. humidity. Tomato pulp can be kept for months if frozen and kept at a temperature of 15 degrees.

All fruit and vegetables should be post-cooled—taken out of the cold storage room and placed in a room at a temperature approaching that of the outside air.

Acid and Water-Proofing Concrete Floors and Troughs.

By T. ABELL, Agricultural Branch.

FARMERS who have laid down concrete feeding floors and troughs in piggeries, and concrete floors in the milking bails, will find that after some time the surfaces become pitted, and eaten away, and when once this condition is evident, the concrete rapidly deteriorates. In the piggery this is due chiefly to the action of the acids contained in the foods, particularly lactic acid of milk. When allowed to remain on ordinary concretes these acids will eat away the cement around the filler, thus causing the surface to become rough, and finally, in the case of poor concretes, to break up.

Research work on this subject has revealed that concrete may be treated in a simple and cheap manner, the result being a surface which is practically impervious to water, resists the action of all but the strongest acids, and at the same time is not slippery, the latter being an important item to be considered when stock have to walk on the treated surface.

The material used to bring about the abovementioned condition in concrete is silicate of soda, commonly known as "water glass," a substance which closely resembles glass, and is soluble in water. It is safe to handle, and its use does not call for any implements other than those customarily used in concrete working.

The action of silicate of soda is as follows:—When mixed with the requisite quantity of water the solution thus obtained is sprinkled over the surface of the concrete. As the concrete is porous, and readily absorbs moisture, the solution penetrates the surface, combines with the concrete, and forms a tough coating, which, after three treatments, will be up to one-quarter of an inch deep.

Quantity to Use.

One gallon of the concentrated silicate of soda should be thoroughly mixed with 4 gallons of water. Five gallons of the solution, prepared as above, will be sufficient for three applications to an area of a little over 300 square feet when treating average concretes. Very dry or porous concretes will require a fourth application of solution.

Method of Use.

For New Concrete.—The concrete floor or trough is made in the usual way. When finishing the surface care should be taken to avoid rendering it over smooth, and consequently slippery. When the concrete is drying, and sufficiently firm to bear the worker's weight, the solution of silicate of soda and water is applied evenly by means of a spray pump, a watering can, with a fine sprinkler, or a soft mop. Do not apply more of the solution than can be absorbed by the concrete. When the concrete has again dried out, a second, and later, a third application should be made as for the first. For average concretes three applications should be sufficient.

Worn Floors and Troughs.—Treatment with silicate of soda is also beneficial for existing floors and troughs which have deteriorated .

The surface should be thoroughly scrubbed with hot water and soap, in order to remove all grease and dirt. Then the whole area is coated over with a mortar made up of one part of cement and three parts of clean, fine sand. When the concrete is firm, and drying out, treat with the silicate of soda solution as for newly laid down concrete.

Surfacing Floors and Troughs in Good Condition.—Old concrete may be treated successfully also, provided the surface is thoroughly prepared as described previously. The method of treatment is the same, but it must be borne in mind that the dry concrete will be more porous than the new, and consequently will require a larger quantity of the silicate of soda solution. Twenty-fours hours after the last application any excess solution should be removed with a mop.

Concrete floors and troughs treated in this manner will give more satisfactory results, as they last longer, are easier to clean, and dry more quickly than the ordinary concrete.

It is advisable to treat the concrete at least once each year to ensure a good water and acid proof floor.

Quartzite silicate of soda may be obtained from James Campbell and Sons, Pty., Ltd., Brisbane.

QUEENSLAND SHOW DATES.

April.

Crow's Nest, 1st and 2nd.
Dalby, 1st and 2nd.
Chinchilla, 7th and 8th.
Tara, 15th and 16th.
Nanango, 16th and 17th.
Miles, 15th.
Kingaroy, 22nd to 24th.
Wallumbilla, 28th and 29th.
Monto, 29th and 30th.
Wondai, 30th April and 1st May.

May.

Goondiwindi, 1st and 2nd.
Longreach, 4th to 7th.
Taroom, 4th to 6th.
Mundubbera, 6th and 7th.
Charleville, 5th to 7th.
Beaudesert Show, 6th and 7th.
Beaudesert Camp Draft, 8th and 9th.
Biloela, 7th, 8th, and 9th.
Wowan, 14th, 15th and 16th (Camp Draft).
Murgon, 7th to 9th.
Goomeri, 13th and 14th.
Mitchell, 13th and 14th.
Ipswich, 19th to 22nd.
Roma, 19th to 21st.
Biggenden, 21st and 22nd.
Gympie, 22nd and 23rd.
Warrill View, 23rd.
Maryborough, 26th to 28th.
Toogoolawah, 29th and 30th.
Kalbar, 30th.

June.

Childers, 1st and 2nd.
Marburg, 6th and 8th.
Bundaberg, 4th to 6th.
Lowood, 5th and 6th.
Boonah, 10th and 11th.
Esk, 12th and 13th.
Rockhampton, 23rd to 27th.
Laidley, 24th and 25th.
Marburg, 27th and 29th.
Mackay, 30th June, 1st and 2nd July.

July.

Bowen, 8th and 9th.
Townsville, 14th to 16th.
Cleveland, 10th and 11th.
Ayr, 10th and 11th.
Rosewood, 10th and 11th.
Nambour, 16th to 18th.
Cairns, 21st to 23rd.
Maleny, 23rd and 24th.
Gatton, 29th and 30th.
Caboolture, 31st July and 1st August.

August.

Pine Rivers, 7th and 8th.
Royal National, 17th to 22nd.
Home Hill, 28th and 29th.

September.

Tully, 11th and 12th.
Innisfail, 18th and 19th.
Southport, 26th.

Mass Production of Pigs.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

STRANGELY enough, pig-breeding on a mass-production basis has never been attempted in Australia, although there are one or two farms in Queensland on which up to 1,000 head of pigs may be seen at any time, and on which pigs are handled in a big way. It is probable that seasonal conditions are too variable in Australia to permit of keeping pigs on ranches or stations on lines similar to those adopted with sheep. In the Argentine, there are several very extensive hog ranches, one in particular with 1,200 breeding sows, all kept on what Departmental Instructors here term the paddock system, that is, open range country. They are fed early in the morning and late in the evening, spending the balance of the day grazing over lucerne pastures, and in season are turned into the corn crops to hog down the corn, the objective being to "walk the crops to market on the hoof."

Plate 132.
A Pig Paddock Muster in Argentina.

Other crops are grown where possible—notably millets—for green food, sweet potatoes, and artichokes (and sometimes peanuts for use with very young pigs) as root crops, with lucerne as the principal fodder fed in its green form as well as in chaff and hay. Probably the largest pig farm along these lines in Queensland is that owned until recently by Mr. C. B. Peter Bell, of Maroon Homestead, in the Fassifern Valley district, and which has now been taken over by Mr. Appleby, of Brisbane.

It is Mr. Appleby's intention to develop the Maroon property as a specialised pig-raising proposition, a hog ranch, even if on a small scale compared with the Argentine ventures. The principal crops in this instance will be corn and lucerne with as many other fodders and root crops as can be grown and utilised on the property.

Agricultural Notes

EVERY agricultural district in the State benefited greatly from the widespread March rains. The late maturing maize and winter forage crops are now assured. In the dairying districts there should be plenty of grass and water right through the winter.

Wheat.

The bulk of the 1935-36 wheat crops has now been delivered to the State Wheat Board, Toowoomba. It is now estimated that the crop will approximate 2,600,000 bushels. Although the yield is lighter, the quality of grain is stated to be outstanding; in fact, it is considered to be the finest since the inception of the Board.

Although the rainfall was much lighter in the wheat areas, sufficient has been received to enable many farmers to proceed with fallowing. More and heavier rains will be required before the planting season commences.

Tobacco.

In the North the tobacco crop was damaged by excessive rains, which in the Mackay district seriously retarded planting operations. Many of the crops in other areas are suffering from continuous wet weather and are making poor headway. If the weather improves soon and good growing conditions are experienced, the yield may yet be in the vicinity of last year's.

Harvesting has been delayed in the southern areas, but curing operations in these districts should be completed early in April.

The first sales of the season took place on the 26th March, and although the bulk of the offerings were carryover leaf, the prices received may be regarded as satisfactory. New season's leaf comprised some good quality offerings from Miriam Vale and Bowen, and the top price of 48d. was given for three lots. A number of consignments averaged from 2s. 9d. to 3s. per lb.

Cotton.

Early March showed cotton crops rather seriously checked owing to moisture shortage and high temperatures in the latter half of February. Severe shedding occurred, and a heavy proportion of premature opening was caused.

Good rain in early March has induced renewed growth, and if frosts are not too early there is a reasonable chance of a good late crop.

Picking is now general in all districts, and receivals of seed cotton are becoming heavy at both Whinstanes and Glenmore ginneries.

Plate 133.

A field of Sudan grass, Coreena Station.

Sugar.

The breaking of the dry spell in the southern cane areas was delayed until mid-March, and as a consequence much of the valuable growing season was lost. In all other areas extensive and beneficial rains were experienced, and at the present time it would appear that the coming crop will be heavier than the 1935 harvest.

Plate 134.

Sorghum irrigated by bore water, about two months' growth. Coreena Station, Barcaldine District. The bore water on Coreena is almost free from mineral matter; it is soft and very suitable for irrigation.

DATE CULTURE in QUEENSLAND

By H. J. FREEMAN, Senior Instructor in Fruit Culture.*

CONDITIONS in the hot, mid-western districts of Queensland are found to resemble those of other countries throughout the world at present producing dates on a commercial footing, and it is with a view to assisting in establishing the date industry in this State that the following remarks are offered.

History.

In order to comprehend fully the various phases of date-growing in their entirety, it seems advisable that an outline of the history of the date should be related. The native habitat of the date palm is not known with certainty, but its existence in Egypt, Arabia, and Mesopotamia can be traced from the dawn of history. It has been grown in Egypt for the past four or five thousand years, although it was probably first cultivated in the Valley of the Tigris and Euphrates. Practices used in caring for the palms and the handling of the fruit, often based upon superstition or religious rites, were handed down from generation to generation, and information obtained from this source was the basis upon which the date-growing industry in the newer countries of the world was established. It has since been proved that such information was often incomplete and erroneous. Since ancient times the date has been the most important food plant in the desert regions of South-Western Asia and Northern Egypt. In more recent years it has been commercialised to such an extent that its fruit is now known in practically every country of the world. Australia alone imports 8,724,999 lb. weight of this fruit per annum.

Possibilities of the Date in Australia.

The first and only dates worth mentioning to be planted in Queensland were in the Rockhampton and Barcaldine districts. These were of no special variety, and, in the main, were seedlings that were merely the result of chance growth from the discarded seeds of some imported date. The palms planted in coastal regions could never be considered a commercial proposition owing to the unsuitability of the climate, whilst those planted in the Barcaldine district have provided definite proof that dates will grow successfully in that region and will, under normal conditions, return from 200 to 400 lb. of fruit per palm, an excellent return for this fruit. It is to be regretted that the Barcaldine dates are so nondescript that the annual sales from the few palms growing there have not been sufficiently large nor has the quality of the fruit been high enough to create a steady demand, or, what in my opinion is more important, to create any inducement for larger areas to be established.

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* The writer wishes to acknowledge his indebtedness to Dr. D. W. Albert and Dr. R. H. Hilgeman, of U.S.A., for much of the material used in the compilation of this paper.

PLATE 135.
Young date palms on the Date Experiment Plot, Barcaldine.

However, one can safely say that from Barcaldine east to Alpha and south to Blackall would be country of a suitable type, as also would be many thousands of acres of western country possessing similar characteristics to the districts named. These necessary characteristics are—(1) a long, hot growing season, (2) moderate winter temperature, (3) little rainfall and low atmospheric humidity during the late summer and early autumn, (4) abundance of water available for irrigation purposes, and the districts above mentioned could, with the aid of irrigation supplied from artesian sources, fulfil such requirements.

It will thus be seen that if commercial areas could be established, only growing varieties of value on the market, success would not be very difficult to achieve. As a subsidiary to the production of wool the growing of dates would be unsurpassed, and the acreage required for a profitable output would not be so great as to necessitate any large increase in the staff needed for the working of these properties at

PLATE 136.

Water supply for irrigation at the 4-Mile, Alice River, Barcaldine. Date experiment plantation adjoins.

present. It must be realised that a ready market for a suitable date at a price of about 4d. per lb. exists throughout the whole of this continent, and the annual consumption would be about 9,000,000 lb. of dates. There is little doubt that if the fruit were produced locally importations would diminish, and the consumption would in all probability be increased with the sale of fresh local dates.

Plate 137.
Date palms at Barcaldine. A yellow variety showing a good crop.

Botany.

The date palm belongs to the rather large family Palmacæ, genus Phoenix, species dactylifera. It is a typical monocotyledonous plant (having only one seed-lobe), producing a single stem with a single growth bud located inside and near the top of the trunk. It may readily be distinguished from the Canary Island palm (*Phoenix canariensis*), grown in Queensland for ornamental purposes, by the presence of offshoots, a more slender trunk, and by the leaves which are glaucous or bloom-bearing instead of bright green. The date palm is diœcious, pistillate, and staminate flowers being produced on separate palms. Both the male and female inflorescences are enclosed in a sheath-like case called a spathe, which splits as the flowers reach maturity, allowing the branched inflorescence with its white waxy flowers to emerge.

Pistillate flowers have very little colour or odour to attract insects. They are composed of three scale-like sepals and three petals folded around three carpels, giving the appearance of a newly formed fruit. If the flower is fertilized, only one carpel develops, but if not fertilized, one or all may develop into seedless fruits which do not ripen normally.

The staminate flowers consist of three small scale-like sepals, three larger petals and six stamens. When the spathe bursts the flowers have the appearance of being crowded on the strands. Soon afterwards, they open and pollen sacs are ruptured releasing the very fine yellowish pollen grains. The pollen has a sweet, musty odour, very attractive to bees.

The feather-like leaves are equally distributed around the main axis in a definite arrangement of thirteen to a whorl. The new leaves develop from the terminal bud, emerging in groups of three. These leaves, referred to as spike leaves, begin to expand when they are 4 to 8 feet in length; attached to the base of each new leaf is a white fibre sheath encircling the growing centre. As the leaf develops, the sheath becomes stretched, torn, and broken by the pressure from the more rapidly growing leaves nearer the central bud. The leaves live for an indefinite period, three to seven years, and young palms retain their leaves in good condition longer than older palms.

PLATE 138.

Date palms with citrus trees interplanted at Barcaldine. The palms are forty years old and are carrying an estimated crop of 400 lb.

Behind each leaf is a single bud which may develop into an offshoot, a fruiting centre, or may die. In a young palm, these buds usually develop into offshoots, but after the palm is five to six years old, they usually form fruiting buds. Bud differentiation probably occurs during March for the following season's crop, and active development of the spathe (inflorescence sheath) begins soon after. The spathes develop slowly in the autumn and early winter. During the late winter and early spring, growth is greatly accelerated and blossoming occurs from August to November, according to the age, variety, and climatic conditions.

The date palm is highly hybridised, therefore no seed is produced which will develop into a plant true to the parent. This has resulted in many varieties exhibiting widely differing characteristics. Many varieties may be identified by their vegetative characteristics alone. Rate of growth is markedly different, varying to such a degree that one variety may grow three times as rapidly as another. The trunks range from slender to stout. The leaves, which are the best index to variety identification, have wide variations; gradations in the midrib range from weak, light, and arched to strong, heavy, and stiff. The area of the rachis covered by the spines and the angles of the spines and pinnæ present a definite arrangement. Spines may be short or long, thick, or slender, and arranged either singly, in groups of two or three, or in all combinations of the above factors. The pinnæ vary chiefly with respect to colour, angle of attachment, length and diameter. Fruit clusters differ with respect to the total number, length, and arrangement of the strands, and the spacing of fruit on these strands.

Plate 139.

Date palm, four years old, showing a crop of approximately 200 lb.

The root system of the date palm is fibrous, resembling that of the maize plant. Primary roots radiate from the base of the palm outward and downward at an angle of 25 to 30 degrees. Secondary or feeder roots branch from the primary roots and have a tendency to grow upward. They greatly increase the feeding area of the root system, since the date root does not have root hairs and must obtain water and plant food by direct absorption largely from or near the root tip.

Requirements for Date-growing Areas.

Date culture has succeeded only in the hot, dry, desert regions of the world. The essential factors for commercial date production may be summed up briefly as follows:—(1) A long, hot-growing season; (2) moderate winter temperatures; (3) little rainfall and low atmospheric humidity during the late summer and autumn. As the date requires a large amount of water, planting should be confined to those localities having a cheap and adequate supply of water for irrigation.

PLATE 140.

Date palm at Barcaldine. Fair type, dark red, four years. Estimated crop 200 lb.

The date palm makes its most rapid growth during the period of high minimum temperatures which occurs during the summer months. It is also found that growth is continuous throughout the year at a rate closely correlated with the mean temperature. Palms growing in the coastal areas where the temperatures are very equable, make luxuriant vegetative growth but do not produce commercial crops.

It has been definitely demonstrated that the date palm requires a climate with excessively hot, dry summers for commercial production. All varieties of dates, however, do not require the same amount of heat units to mature their fruit. It has also been shown that winter temperatures have a direct influence on spathe growth and the subsequent time of blossoming. The temperatures which occur after blossoming apparently have more effect on the time of ripening than does the date of blossoming.

The response of the date palm to temperature conditions may be used in selecting varieties for different localities. Varieties planted in areas which have a relatively mild temperature should be limited to those requiring the lesser heat to mature their fruit. Dates may be grown in such areas provided the winter temperatures are not so low as to cause belated blossoming or undue injury to the foliage. Fortunately, the date palm can endure severe extremes in temperature. There is no record of the date palm being injured by high temperatures, and records show that mature palms have survived temperatures as low as 4 deg. Fahr. There is, however, a noticeable difference in hardiness between the different varieties.

PLATE 141.

Date palms at Barcaldine carrying a heavy crop of fruit after recent burning of all foliage.

After temperature requirements have been satisfied, the next most important factor is the relative absence of rainfall and high atmostpheric humidity during the period the dates are ripening. Rain at this time causes serious damage, and high relative air humidity adds to the actual rain damage by creating conditions favourable for bacteria and fungi to attack the ripening fruits. Instances have been observed where rain has also caused damage to immature fruit. However, not only the amount of rain, but the relative humidity and condition of the fruit influence losses. For example, a heavy shower followed by an extended period of cloudy weather and high atmospheric humidity may cause a heavy loss. Furthermore, seasonal temperature variations may so influence the time of ripening that rain occurring during a certain month may do serious damage in one year but not in another. Thus, the average amount of rainfall serves only as an indicator of the possible damage during that period.

The date palm is not exacting as to the type of soil in which it grows. Climatic conditions are more important than soil texture in selecting the site for a grove. Date palms, like other fruit-bearing trees, grow and produce more abundantly in a good soil than they do if planted in the poorer soil types. Inasmuch as the date palm is deep rooted, a soil at least 6 feet deep is desirable; however, many successful plantings are found on comparatively shallow soils. Soil fertility and proper moisture conditions are more easily maintained in deep soils.

PLATE 142.

Date palm at Barcaldine, 3 years old. Yellow variety. Dates small and light weight.

Observations would indicate that palms planted in light soils mature their fruit earlier and more uniformly than in the heavy soils. Light soils dry out more quickly on the surface after irrigation or heavy rain which is advantageous during the ripening season. Heavy clay-type soils dry out very slowly and thus tend to prolong the period of high atmospheric humidity.

Propagation.

Date palms can be propagated either from seed or from offshoots. New varieties are obtained from seed, but after a variety is once established it can only be increased by means of offshoots. The present "standard" varieties grown commercially throughout the world originated from seed and, because of their outstanding characteristics, have been propagated in large numbers by means of offshoots.

A large number of seeds of any given variety will produce, theoretically, an equal number of male and female palms. These palms so produced may be unlike the mother palm and unlike each other in character of growth. The fruit from the female palms will differ in size, shape, colour, and quality. Unfortunately, the chance of obtaining a variety having superior characteristics from seed is very remote. The disadvantage of seedling dates is the inability of the grower to standardise his product and the high cost of handling the many different types and grades in the packing house. The latter objection also applies to the grower who plants a few palms of each of the standard varieties.

Plate 143.

Mounding soil about the base of the palm will permit root development on those offshoots which originate just above the ground line.

Offshoots are produced from auxiliary buds at or near the base of the palm. As they are a vegetative part of the parent palm, offshoots are identical in sex and in vegetative and fruiting characteristics with the parent. Varieties differ as to the number of offshoots produced, but from ten to twenty-five covers the increase in most cases.

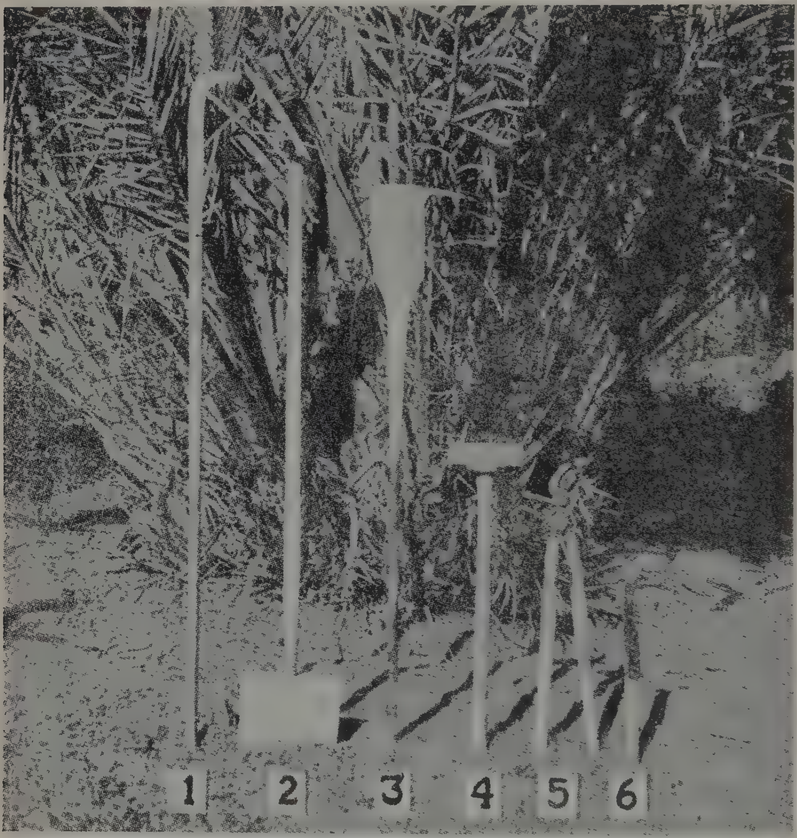


PLATE 144.

Tools used in cutting offshoots. From left to right: Pruning hook for removing leaves, shovel, chisel for severing connection of offshoots to parent palm, sledge hammer, lopping shears for pruning leaves, and knife for removing spines. Each offshoot should have an abundance of soil around its roots.

Young palms producing a large number of offshoots are retarded in growth and in fruit production. Offshoots that have been allowed to remain attached to the parent palm until quite large produce a smaller number of offshoots than those which have been removed at an earlier stage. It is therefore desirable to remove an offshoot as soon as it is sufficiently mature to ensure growth response when planted.

The maturity of an offshoot is indicated by its root development, blossoming, offshoot development, and by a stretched condition of the fibre about the trunk of the offshoot. The age and size which an offshoot must attain before removal will depend on the variety and vigour of the parent. Palms which have been forced into a very rapid growth through irrigation and fertilization will develop large but succulent offshoots which are very difficult to propagate. Some varieties produce very hardy offshoots which can be successfully propagated when young, whilst others are very delicate and give trouble even though the offshoots are older and larger. As a rule, larger offshoots are more likely to grow than are smaller ones, especially if they have developed a good root system. The present tendency is to remove an offshoot when it is 8 or 10 inches in diameter, weighs as least 30 lb., and shows the other indications of maturity.

PLATE 145.
Removing offshoots from the parent palm for transplanting.

Offshoots which have a well-developed root system respond more quickly after planting than do unrooted ones. Root formation can be encouraged on those offshoots which develop at or just above the ground line by moulding soil about their bases. In case the offshoots are at such a height as to make mounding impracticable, a box can be built around the base of the offshoot. This box is filled with a mixture made of equal parts of sand, soil, and well-rotted stable manure. The soil in this box must be kept moist throughout the rooting period. Eight to ten months is required for mounded or boxed offshoots to develop a sufficient number of roots to warrant removal. Rooting offshoots by boxing is expensive and is justified with only the more valuable varieties. The high offshoots of less valuable varieties are removed and planted in a nursery where special care can be given them and where rooting may be accomplished with less expense. Offshoots planted in a nursery, regardless of their condition, should not be transplanted for at least one year, and in many instances two years.

Time of Year to Plant Offshoots.

Early spring is the recognised time to plant offshoots, and commercial field practices in America and other date-producing countries have substantiated this fact. Offshoots planted during this period have full time to become established before growth is retarded by the cold weather in the winter.

Pruning Offshoots.

Many growers are tempted, due to the inconvenience of working around young palms, to remove the outer leaves of offshoots. This practice is not recommended since the amount of growth an offshoot makes, other conditions being equal, will be in proportion to its leaf area. As size is an important factor in propagation, no green leaves should be removed from an offshoot until it is to be removed for planting.

PLATE 146.
After the offshoot is detached some of the outer leaves are removed and the remaining ones are tied tightly together and topped.

The principle that pruning retards growth is sometimes used to advantage on offshoots that have made too rapid and succulent growth. By removing part of the foliage from such offshoots six or eight months in advance of their removal, growth will be checked and the tissues of the offshoot will harden, thus lessening the danger of fermentation occurring in the heart tissue after planting. Pruning is also used on varieties that produce a large number of offshoots to stimulate growth in a few offshoots at the expense of others. In such cases, the leaves on part of the offshoots are pruned back close to the crown which retards their growth. The surplus food thus made available stimulates growth on the unpruned offshoots and on the parent palm.

Removing Offshoots.

Offshoots are attached to the parent palm by a comparatively small stalk-like connection. The length and diameter of this connection differ with each variety. To remove the offshoot, this connection must be severed and, as this is the most exacting part of propagation, only persons who are familiar with the principles involved should undertake the operation.

A special date chisel is used to sever this connection. It has a rectangular cutting blade—9 inches by 4½ inches by 1 inch—with one side flat and the reverse bevelled towards the sides and toward the end in such a manner as to form three sharp cutting edges. It is made of tool steel and tempered so that a good file will only polish it. This blade is welded to a 48-inch iron handle, 1¼ inch in diameter. The weld should be well reinforced to withstand heavy stress applied to the handle.

Other tools necessary for removing offshoots are an 8 or 10 lb. sledge hammer, from which the temper has been partially withdrawn to prevent battering the chisel handle; a long-handled post-hole shovel; a long-handled pruning hook for removing leaves; a pair of large pruning shears for trimming the top leaves and leaf bases; and heavy twine or light wire to draw the remaining leaves of the plant together.

PLATE 147.
The partial shade provided by date palms should supply an excellent environment for interplanted citrus.

It is advisable to irrigate the date grove several days before the offshoots are to be removed so that the soil will be moist and easy to work. Each plant should have abundance of soil packed (balled) around its roots. Moist soil can be balled easily as it adheres well to the roots. To facilitate working around the offshoots, all of the lower leaves are pruned off and the remaining ones tied tightly together. The offshoot is then balled, leaving 4 to 6 inches of undisturbed soil about the root area. At this time the connection between the offshoot and the parent palm is exposed and definitely located.

In removing an offshoot, the flat side of the chisel should face the offshoot. The connection is cut from the side, the chisel being set at an angle perpendicular with the plane of the offshoot and the parent palm. This angle is such that the chisel will cut the connection as closely to the parent palm as possible without damaging the permanent tissue. The chisel is driven carefully and, after several blows from the sledge hammer, the handle should be manipulated up and down to avoid wedging of the cutting blade. As the cutting blade is often entirely hidden, progress of the chisel as it is being driven can be estimated by watching the movement of the offshoot. If the chisel is set below the centre of the connection, the top of the offshoot will move toward the palm; if above, the movement will be away from the palm. To release the chisel after a cut has been completed, the handle is manipulated up and down, parallel to the cutting blade while a steady pull is exerted on it. The cutting blade is so bevelled that, if not driven too deeply, it will cut its way out. In no case should the chisel be used as a pry until the offshoot connection is severed. The first cut is made at the side and just below the centre of the connection, followed by a second and, perhaps, a third cut above the first; if the offshoot has not been freed by these cuts, similar ones are made on the opposite side. Where the offshoot is well rooted it will be necessary to drive the chisel beneath the ball of earth to sever downward growing roots.

PLATE 148.

The offshoot is planted in the centre of a shallow basin so that soil may be filled in against its developing offshoots when necessary to insure root development. The planting depth is at the greatest bulb diameter, and the stubbed leaves are protected with a hessian wrap.

Care must be used that no unnecessary strain or stress is placed upon the offshoot during the cutting operation or in subsequent handling, as the inner tissue near the terminal bud is very succulent and breaks easily. Also, it is important that the offshoot be cut without damaging either the offshoot or the parent palm. The entire operation requires skill, patience, and good judgment, acquired only with experience.

After the offshoot is removed from the palm, all the leaf stubs are pruned back close to the fibre, and all but ten or twelve mature leaves are removed. The remaining leaves are then tied tightly together with heavy twine or wire and cut back even with or slightly below the end of the first spike leaf. The foliage is cut evenly across the top in order to more readily observe subsequent growth.

If the offshoot is to be moved a considerable distance, or if planting is delayed, the balled roots should be covered with hessian and kept moist by sprinkling with water. Offshoots that are to be shipped considerable distances may be protected in transit by covering the ball with wet sphagnum moss or other material of good water-holding capacity, held in place with a hessian covering.

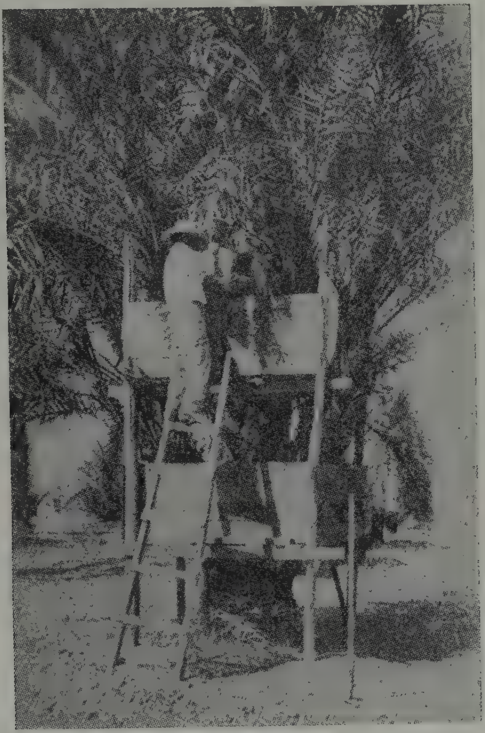


Plate 149.
Root development can be induced on offshoots located high on the mother palm by means of boxing.

Care in handling offshoots cannot be over emphasised. To drop an offshoot or give it a sudden jar may injure the heart tissue, or dislodge the soil about the roots. An offshoot should never be handled by its inner leaves as the leaf bases are very tender and may be broken, thereby exposing or injuring the heart tissue.

Planting Distance.

The planting distance for palms should be governed by the type of soil, the variety, and climatic conditions. Experimental data and general observations in America have shown that plantings of mixed varieties are most successful where they are planted at least 30 feet apart by the square system. This gives approximately forty-eight palms per acre. This spacing allows free circulation of air throughout the date grove, which is an advantage during the periods of frequent rains. Free air current carries off the excess moisture from the fruit and lowers the atmospheric humidity.

I have been advised that, in the Old World, palms are frequently interplanted with many other types of fruit trees, such as citrus, fig, pomegranate, apricot, and with grapes and vegetables, and this practice is adopted in America. It is possible in the future that interplanting will become an important feature within most date groves. Interplanting with citrus has been adopted by growers at present in Arizona with success, and there are instances where the shade supplied by the tall palms has allowed a variety of tropical and subtropical fruits to be grown which previously were not considered adapted to exposed conditions.

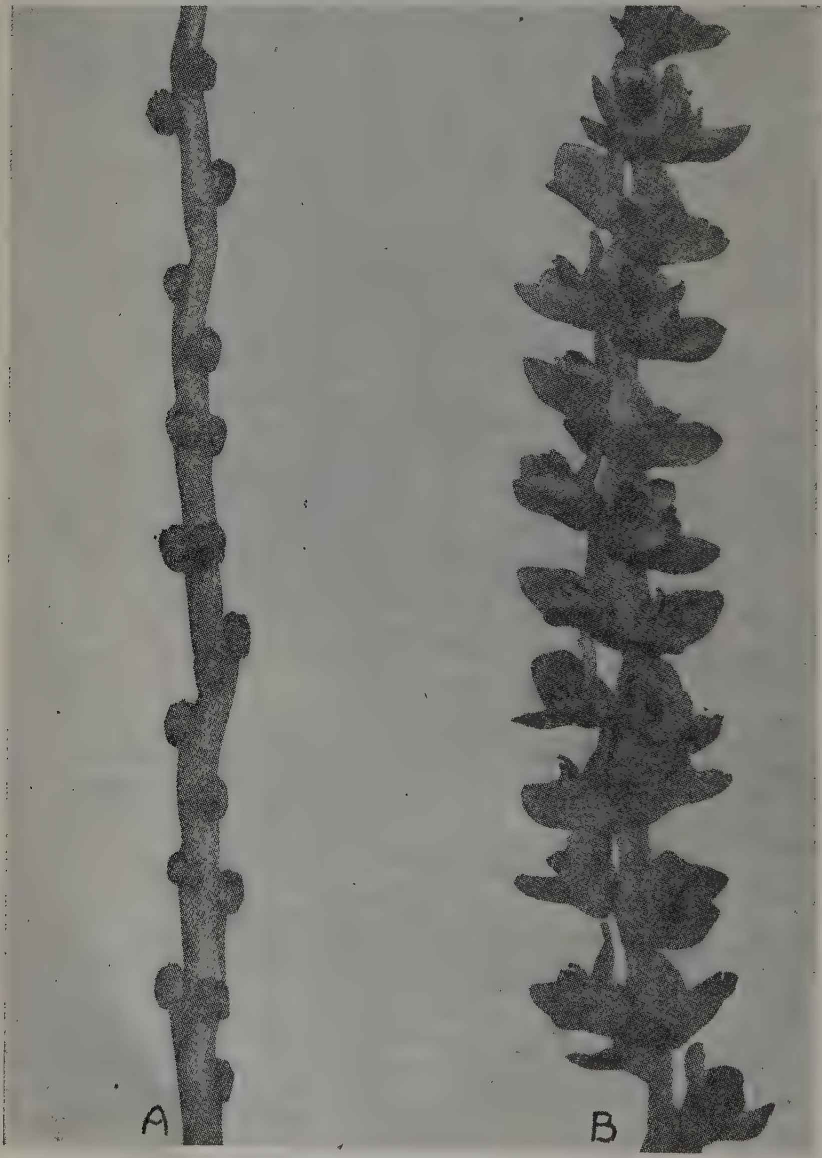


PLATE 150.

A. Female flowers resemble newly developing fruits. A single strand from the female flower cluster is illustrated. B. The male flowers are larger, more open, and more nearly resemble common flowers.

PLATE 151.

Citrus fruits are suitable to interplant with dates. A Valencia orange tree, six months old, on Mr. E. Baker's farm, on Alice River, 8 miles from Barcaldine.

PLATE 152.

Peaches are also suitable as a subsidiary crop to date-growing. A six-months-old tree on Mr. E. Baker's farm, near Barcaldine.

Planting Offshoots.

It is desirable to prepare the holes for planting several months in advance. They should be 3 feet in diameter and 3 feet in depth and filled with a mixture of equal parts of farmyard manure and good top soil. The prepared holes should be irrigated every three or four weeks so that the organic material will be somewhat decomposed and the soil settled before planting time. The composted soil will supply free drainage and an ideal medium for the newly established root system of the young palms. The cost of preparing the holes will be more than offset by the increased growth made during the first few years.

PLATE 153.

Crops suitable for interplanting with dates. "Long beans" growing on Mr. E. Baker's farm, near Barcaldine.

If the holes are not prepared in advance of planting time, they should be dug only of sufficient size to accommodate the offshoot. If dug larger and refilled, the soil will settle and lower the offshoot to such an extent that irrigation water may cause injury or death.

Perfect alignment of offshoots at the time of planting will add much to the attractiveness of the grove. Nearly all fruit-bearing trees develop lateral branches which serve to minimise small errors in alignment, but the mature date palm has a barren trunk and small irregularities are readily detected. To facilitate correct planting, the field is squared and laid out, with a stake driven in at each place an offshoot is to be planted. The holes are then dug around these stakes.

Before planting the offshoot, a depression 4 to 8 inches deep and 6 feet in diameter is made around the hole. The offshoot is planted in the centre of the basin to the depth of its greatest bulb diameter, yet never at a depth to permit irrigation water to come up into the loose fibre near the crown. Loose moist top soil is pressed firmly about the base of the offshoot until the hole is half filled, at which time a small stream of water is directed into the basin, and the soil worked in carefully to exclude all air pockets. A mulch of dried grass, hay, or manure is then placed in the basin to keep the surface soil from drying out and shrinking away from the sides of the offshoot. New roots will not develop unless moist soil is kept in direct contact with the base of the offshoot. Several inspections during the first few weeks after planting should be made to make certain that this condition is maintained.

PLATE 154.

Other crops suitable for growing in conjunction with dates in Queensland. "Long beans," tobacco, and sweet potatoes, Mr. E. Baker's farm, near Barcaldine.

Care of Offshoots after Planting.

After the offshoots have been planted, the foliage should be protected from the direct rays of the sun. Shading prevents sunburning of the outer leaves and lessens evaporation from the entire leaf area. A simple, inexpensive method of covering is to wrap the leaves with one or two thicknesses of light-weight hessian, leaving the top 2 or 4 inches of the leaves exposed. Allow the hessian to extend towards the base sufficiently to shade the crown of the offshoot, but not far enough to come in contact with the irrigation water. Having the top exposed allows the offshoot to be inspected without disturbing the wrapping material. Such covers are usually allowed to remain on the offshoot until the following spring.

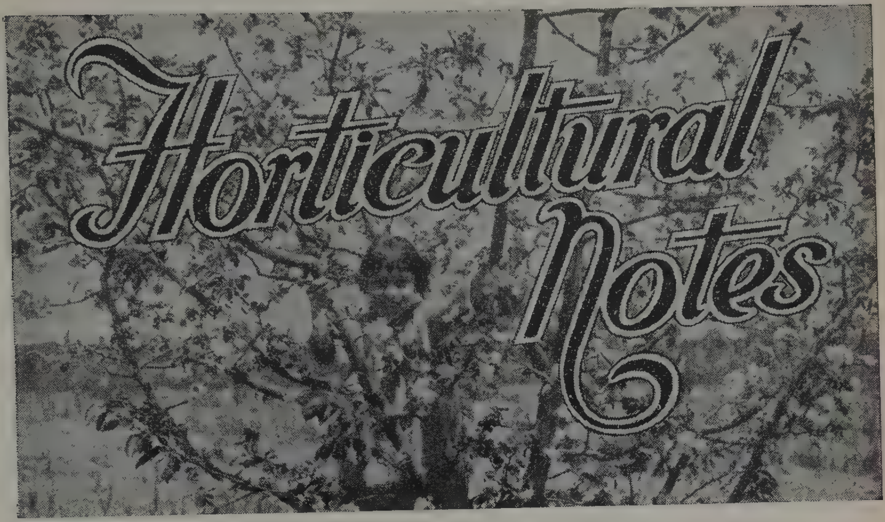
The leaves are kept tightly bound together until active growth begins. After this occurs, the tie is loosened from time to time as new leaves push up through the centre. The tie should be retained until the second growing season, as it serves as a brace for newly-formed leaves, preventing wind breakage. The leaves should be of sufficient size to support themselves before the tie is removed.

It is necessary to keep the soil moist at all times until the offshoot has established a new root system. This requires light but frequent applications of water, the interval between irrigations being determined by the type of soil. During the summer months a light sandy soil may require an irrigation every two or three days, while a heavy soil may remain sufficiently moist with one irrigation a week. No definite rule may be set with regard to this interval, the chief objective being to keep the soil moist. There is some danger of over-irrigation in very heavy soils with poor drainage, particularly if a heavy mulch is used in the basin. Over-irrigating will result in poor aeration with possible loss of the offshoot. During the autumn and winter months, when growth is retarded by lower temperatures, the interval between irrigations should be lengthened.

Irrigation water is applied to the basins from a supply furrow extending along each row of offshoots, 18 to 24 inches from the rim of the basin. The water entering the basin is regulated so that it will not stand more than 2 or 3 inches deep, and is held in the basin until it has penetrated below the depth of the root area. A careful inspection should be made during the first few irrigations to see that the water does not stand high enough to enter the crown of the offshoot. Water in the crown may cause the succulent tissue to ferment and rot, resulting in the death of the young plant.

[TO BE CONTINUED.]

PLATE 155.
On the Russell River, North Queensland.



SOME TROPICAL FRUITS.

No. 8—THE CUCUMBER TREE.

S. E. STEPHENS, Instructor in Fruit Culture.

THIS tree, known botanically as *Averrhoa bilimbi* L., is closely related to the Five Corner, and, like it, is generally regarded as being a native of the Malayan region of tropical Asia.

The tree grows to about the same size as the Five Corner, but may be distinguished from it by the larger compound leaves, which are composed of from five to seventeen pairs of leaflets, and by its flower, which is crimson coloured. The fruit is 2 to 4 inches long, greenish-yellow, and translucent when ripe, obscurely five-angled or almost cylindrical. The flesh is juicy and very acid.

The fruit is used chiefly for pickling.

This tree, with its cogener, the Five Corner, was introduced to the Kamerunga State Nursery at Cairns some thirty to forty years ago, and distributed therefrom.

Cultural requirements are similar to those of the Five Corner. Propagation is usually by seed, although P. J. Wester reports having been successful in shield budding the tree. He advises the use of non-petioled, ripe budwood of brown colour, and to cut the buds 1½ inches to 2 inches long.

Common names for the Cucumber tree in other countries are "Bilimbi," and several slight variations thereof, and "Camia."

GREEN MANURING IN THE ORCHARD.

By R. W. PREST.

THE loss of soil organic matter is a major problem in tropical agriculture the world over. The seriousness of this problem in Queensland is evidenced by the unsatisfactory conditions prevailing in many of our citrus orchards.

This loss is indicated by the unhealthy condition of the trees which shows that, despite every effort to fertilize the soil, it has gradually become poorer and infertile. In citrus trees, a leaf disease known as "Mottle Leaf" frequently makes its appearance. This disorder is intimately associated with a deficiency in soil organic matter. Die back or exanthema may develop and one disease follows another.

Humus, a product of the decay of organic substances, is one of the most important ingredients in any fertile soil and, generally speaking, is present only in inadequate amounts in most of our citrus soils. Except on alluvial land periodically improved in fertility by floodings, the orchardist must consider the maintenance or improvement of the soil fertility if he is to harvest good crops. When the soil has been under cultivation for some time without any addition to the humus supply, it will be noticed that it differs markedly in physical condition from its virgin state. The heavier loam soils are more inclined to run together with rain and bake and crack more readily when drying. This is due to a large extent to the loss of organic matter or humus. This loss takes place more rapidly in warm, moist districts, and where catch crops are intercultivated. In effect, the clay particles have a tendency to break down into a very fine dust which finds its way into the interstices between the soil particles and, with the diminishing supply of humus, tends to cement them, excluding air and water. Sandy soils lose their organic matter even more rapidly than loam soils under cultivation, and trees and plants suffer on such soils. In the absence of adequate supplies of humus, their tendency is to heat up, and soil moisture is lost through evaporation, and particularly by percolation beyond the reach of the feeding roots.

In the absence of bulky organic farmyard manure, the maintenance and improvement of the soil may be carried out by growing and turning under green manure crops. Not only do such crops build up the physical condition of the soil, but their presence reduces soil losses by erosion during periods of heavy rainfall.

The effects of ploughing green plants are both direct and indirect. The bacteria which inhabit the soil, and are necessary for the breaking down and building up of soil materials in the process of releasing plant foods, live on the vegetable matter in the soil, and at the same time convert it into humus. The compounds that result from crop decay increase the absorptive power of the soil and promote aeration, drainage, and granulation, conditions extremely important in plant growth. If the crop turned under is a legume (leguminous plants have a species of nitrogen-fixing bacteria which attach themselves to the roots), and the nodule organisms are active, the store of nitrogen in the soil is markedly increased, a point of extreme importance in fertilizer practice.

Green manures may function as cover crops in as far as they take up extremely soluble plant nutrients and prevent them from being lost in the drainage water. The nitrates of the soil are of particular importance in this regard, as they are very soluble and are only slightly absorbed by the soil complexes. The added organic matter acting as food for the soil organisms and stimulating biological action, is especially important in the production of carbon dioxide, ammonium nitrates, and organic compounds of various kinds which are essential for plant nutrition.

At best green manuring crops should possess three characteristics —rapid growth, abundant and succulent tops and, with fertilizing, successful growth even in poor soils.

The crops that may be utilised as green manures are usually grouped into two heads—legumes and non-legumes. Some of the common green manures are as follows:—Legumes: Black cowpea, poona pea, crotalaria, beerseem, field pea, lupins, vetches, tick bean. Non-legumes: Mustard, rape, barley.

In the coastal belt, the practice when green manuring has been to utilise the summer rainfall, planting such crops as black cowpeas, poona peas, and crotalaria during November and December and turning under during March. Winter green manuring with crops such as beerseem, vetches, field peas, tick beans, lupins, rape, and mustard could be practised with advantage in many instances, particularly in young orchards, on the lighter sandy soils and where irrigation is practised, planting taking place during April and May and turning under in July.

Citrus trees up to four or five years of age occupy a relatively small proportion of the total area on which they are planted. Their roots do not extend far from the trunk and do not take up the amount of space occupied by the roots of old established trees. Thus, during their early years, an excellent opportunity is afforded for building up a reserve of vegetable matter in the soil.

Cultivation, even early in the season, may be confined to the immediate vicinity of the trees, and by far the greater amount of the space down the centre of the tree rows occupied in growing and turning under summer and winter green manure crops. A strip along each side of the tree is thus being cultivated frequently.

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MARKETING ROCK MELONS AND CANTALOUPES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

WHEN visiting the markets, one is often impressed with the haphazard manner in which many of the products of the land are still marketed. Bags, loose heaps, and other unhygienic methods are used to bring in and display many of the commodities that will afterwards be used to grace our tables as articles of diet. It has been found possible to discover methods of packing for all fruits, enabling first-rate articles to be obtainable all over the world.

Rock melons are no exception to the general haphazard ways of handling commodities for market. When visiting a grower it was one day suggested, in the course of conversation, that it should be possible to use some method of packing for melons as for apples and other fruit, to assist in placing them on the market in a better condition. A heap

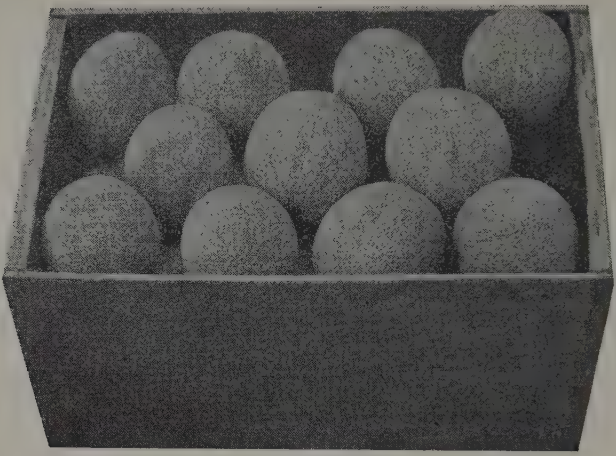

PLATE 156.

Showing the method of packing the 2-1 pack. This pack contains three layers and, as illustrated, would contain the following in each layer:—

1st layer, 11; 2nd layer, 10; 3rd layer, 11—Total, 32.

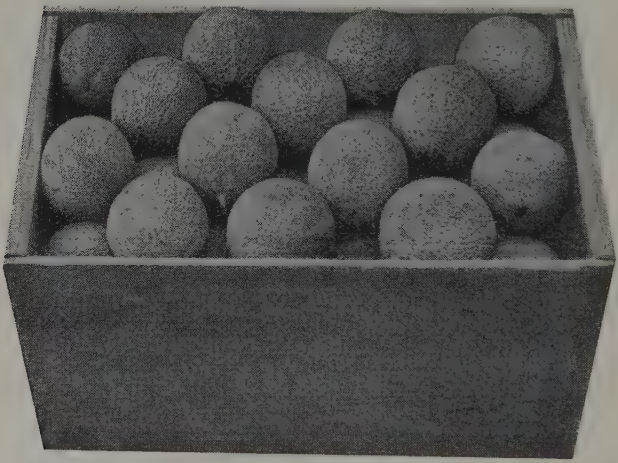

PLATE 157.

Showing the method of packing the 2-2 pack. Each layer contains the same number of melons.

of melons being available, they were approximately sized up and experimental packs made. It was found that the standard bushel case, as made for apples, was the most satisfactory type of container. The internal dimensions of this case are 18 inches long by 11½ inches wide by 10½ inches deep. The illustration will serve to show the packing method used. The same system of diagonal packing as is used for all fruit packing was adopted in this pack. One layer is a replica of another, each melon in every layer except the first fitting into the "pockets" or spaces of the layer beneath. By using this method, it is quite easy, when the pack is finished, to mark the correct number or "count" of the contents of the case. Care in handling is vitally necessary, and no difficulties should be found if common sense is used.

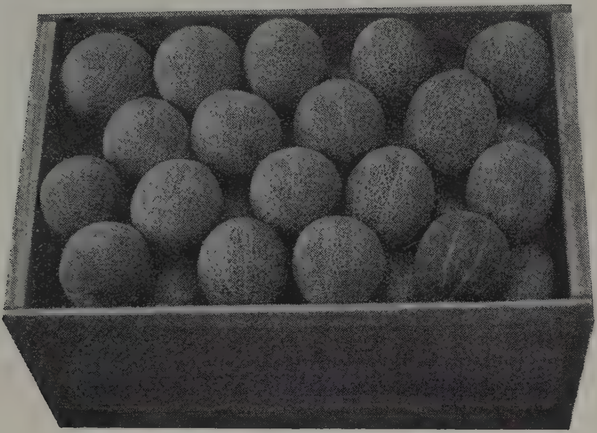

Plate 158.

Another 2-2 pack illustrated. 2-2 packs can contain either three or four layers according to the size of the melons.

The following are the principal features to be borne in mind:—

1. Grade the melons into approximately the same sizes before beginning to pack.

2. Place the flower or bottom end of the melons in the pockets or spaces for protection, as it is this part of the melon which softens first when ripening.

3. Place the second and successive layers in the pockets of the layers beneath.

4. When counting some of the 2-1 packs, such as that illustrated, it should be noted that the top and bottom layers contain one more than the centre layer—viz., top layer, 11; second layer, 10; bottom layer, 11—total, 32.

5. Pack ¾ to 1 inch above the top of the box and gently ease into position before nailing lid on.

6. Stack the packed cases always on their sides when carting or railing to market.

FRUIT MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

WITH April, the end of the Queensland fresh apple season draws to a close. The season generally has been a good one, although spoiled partially by hailstorms. Prices for the last month have been steady and satisfactory for most varieties. Papaws reached exceptionally high prices during the month, up to 20s. per case being realised. Banana prices have not shown any marked improvement. Grapes have maintained steady values and vignerons should have a satisfactory season.

Temperate Fruits.

Apples.—Prices were:—Granny Smiths, 6s. to 9s.; Jonathans, 6s. to 9s.; King David, Rome Beauty, Democrats, 6s. to 8s.; Dunns, 5s. to 6s.; Delicious, 6s. to 8s. Southern Jonathans are now arriving on the market and selling 6s. 6d. to 9s. Codling moth has been very prevalent this season, and growers are advised to take all precautions to destroy, as far as possible, all the grubs that can be found in the cracks of the sheds and picking boxes, &c. Scalding the picking boxes for two to four minutes would be of assistance in killing many.

Stone Fruits.—The season is now finished, and growers would do well to clean up their packing sheds and spray them with a 5 per cent. solution of formalin to assist in checking the carrying-over of brown rot. A few late varieties of peaches were sold at 2s. to 4s. 6d. per case.

Grapes.—Prices were:—Muscatels, 6s. to 8s. 6d.; Gros Colman, 4s. to 5s.; Waltham Cross, 5s. to 10s.; other varieties, 4s. to 7s. Values have been very steady, and the quality this season, notwithstanding a sprinkling with hail, has been excellent.

Pears.—Prices were:—Stanthorpe pears, 3s. to 5s. per case; Southern pears, 4s. to 9s. The market price, of course, depends largely on the variety. Growers contemplating planting pears should study this factor closely.

Tropical Fruits.

Papaws.—This fruit has touched very high prices for good quality lines, up to 20s. being obtained for choice Yarwun fruit; 3s. to 8s. per bushel case has been the average price. From next month onwards, closer attention will have to be paid to colour and maturity as the weather becomes cooler.

Custard Apples.—The first of this luscious fruit is now being marketed. Maturity will be the governing factor on early prices. Careful selection of fully developed fruit and good packing will more than pay. Six shillings per case is quoted. Fruit should not be marketed until the interstices of the fruit show a creamy colour if maturity is to be maintained. Sydney prices are 8s. to 10s.

Pineapples.—With factory assistance, the market has maintained a steady price and demand—3s. to 7s. a case for various sizes of smooths, loose 1s. to 4s.; Ripleys, 6s. to 8s. 6d. per case, loose 1s. to 4s. a dozen. Sydney, 7s. to 9s.; Melbourne, 8s. to 11s.; Adelaide, 15s. to 17s.

Bananas.—A slight improvement in price has been made, but it will be a long time yet before really good prices will be obtainable. Sixes, 4s. to 7s.; sevens, 4s. to 9s. 6d.; eights, 5s. to 10s. 6d. Prices in Melbourne and Sydney have remained steady, but need to improve to make things profitable. Melbourne, nines and eights, 13s. to 14s.; sevens, 11s. to 12s.; sixes, 9s. to 10s.; Sydney, 5s. to 11s. per case; Adelaide, 13s. to 16s. A booklet on marketing bananas should be available in May.

Mangoes.—Mangoes are now off the market after a very unsatisfactory season owing to dry Northern conditions during the summer.

Citrus Fruits.

Grape Fruit.—Melbourne prices for good grape fruit are 14s. to 16s. It must be remembered that only good quality fruit of the Marsh Seedless type is wanted.

Oranges.—The fresh orange season is rapidly approaching. Growers' attention is called to the necessity for marketing matured fruit only. Fruit, the juice of which does not conform to the maturity standards, will be prohibited from sale. Supplies of Valencias are still coming from Southern States to fill the gap between crops.

Lemons.—High prices have been maintained for good lines, Gayndah and Benyenda realising 12s. to 18s. per case; others, 8s. to 12s.

Miscellaneous Fruits.

Tomatoes.—At the latter end of March, the market was oversupplied, possibly owing to the closing of the northern railways through floods; 1s. to 4s. prevailed during this period.

Passion Fruit.—Passions have maintained the high rates of last month, up to 15s. being paid. Prices in the Southern markets have also been maintained at high rates.

In conclusion, one can say that at no time during the month has good, well-packed fruit hung fire on the markets. Every assistance possible that will lead to better marketing will be given by the Department of Agriculture and Stock. Applications should be made to the Under Secretary, Department of Agriculture and Stock, William street, Brisbane.

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PIG PRODUCTION RECORDING.

Another good litter of Large White pigs has been recorded by the Department, and the results given below should interest pig-raisers.

The litter which is owned by Hibberd Brothers, Grenier Park Stud, Indooroopilly, is from the sow Highfields Pearl 11th and sired by Norfolk Baron 2nd.

There were twelve pigs born in the litter on the 30th December, one dying on the first day and another being accidentally killed during the second week.

Tattoos or Earmarks	86	87	88	89	90	91	92	93	94	95	96	Total.	Average.
Sexes	B.	B.	B.	B.	B.	B.	B.	S.	S.	S.	S.		
Weight—	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
At Birth	3½	3½	3½	2½	3½	3	3½	2½	3½	3	3	35	3·1
At 1 week ..	5½	7	5	4	7	6	6	6	6½	6	4½	63½	5·8
At 2 weeks ..	8	10	7½	6½	10	9	9	8½	*	8	7	83½	8·3
At 3 weeks ..	11	13	10½	9½	13½	11½	12	11½	..	12	10½	115	11·5
At 4 weeks ..	13½	15	12½	10½	17⅓	14½	16	14	..	13½	13	140	14·0
At 5 weeks ..	17	20½	17	15	23	19	21	17½	..	17½	17½	185	18·5
At 6 weeks ..	24	27½	23	19	29	24	23½	23	..	22	21½	236½	23·6
At 7 weeks ..	33	37	31	25	39	31	25	29	..	29	25	304	30·4
At 8 weeks ..	42	46	37	30	46	39	29	38	..	35	30	372	37·2

* Killed.

Erosion in the Empire.

Subjoined is an extract from an article by G. C. Watson in the JOURNAL OF THE ROYAL EMPIRE SOCIETY, *October*, 1935. *Dealing with such an important world-wide problem, it has an especial interest for Queensland farmers.*

TO-DAY millions of acres of the Imperial domain all over the world are in danger of destruction by the uncontrolled forces of erosion. In many parts huge areas are losing their original fertility; in others, immense tracts of once valuable land have already reverted to desert, while many more are "on the way." If such basic sources of the Empire's wealth are to be maintained it is evident that more effective anti-erosion schemes must be instituted.

If you speak of erosion nine people out of ten wonder what you are talking about. The other one, if he happens to be a farmer, will probably admit that "something should be done about it," but that it is a subject which mainly concerns the "Government." This, of course, is a fallacy. It is the concern of all. Every patriotic person who has a thought for the Empire's future should be interested in the problem of checking erosion and preserving the land for future generations.

There is no more insidious enemy than erosion. Its work is incessant and often unseen. We are scarcely aware of its far-reaching activities until some serious catastrophe demands public attention.

Not many years ago the Mississippi floods caused widespread damage and distress. "Old Devil River" had overflowed his banks to a far greater extent than usual. Again, quite recently, we hear of townspeople and farmers along the banks of this great waterway having to flee for their lives from the rising flood. About the same time news comes of a dust-storm in Western Kansas, "denser than any yet experienced."

These catastrophes, and other similar ones, it is realised, are almost directly due to erosion. They should be regarded as timely warnings of what may happen if their incidence is not checked by applying control measures.

At one time nearly half the watershed area of the Mississippi consisted of forest land. Now, owing to the enormous demand for wood pulp for newsprint (and for other purposes) this forest area has been reduced by about one-half. President Roosevelt, we hear, is allocating the sum of two hundred millions entirely to the work of combating erosion in the United States; is not this an indication that more might well be spent in many parts of the Empire in checking the same evil?

Let us now glance at some of the "danger spots" of erosion within the Empire. South Africa, of all Empire countries, has perhaps suffered most for want of effective anti-erosion measures. Here, Nature is not so kind as in northern latitudes like Canada where a protective "blanket" of snow is provided during winter months. Moreover, the relentless rays of a sub-tropical sun beat down through the rarified atmosphere of her plateau with withering effect. Floods and droughts alternate at all seasons of the year, taking their toll of life and property, almost as a matter of course. Her gold in some measure may compensate; but it can never pay for the permanent loss by erosion of huge tracts of her arable land. Here, as with the Mississippi, the wooded catchment areas of many of her big rivers have suffered neglect, and many and extensive have been the resultant evils. Of this the Orange River provides one example. This river alone, within living memory, has carried into the seas sufficient fertile soil to produce crops which would feed the whole of the sub-continent. The same may truly be said of the Zambesi, the Limpopo, and other South African rivers. Owing to the severe losses in the past, vigorous anti-erosion schemes are now on foot, especially for the preservation of forest areas, and particularly of Basutoland, whose wooded mountains give rise to this magnificent river.

In Australia we have many other examples of incalculable loss from erosion—the Murray River affords one. Although its annual flow has remained constant for fifty years, the summer flow has been reduced by nearly one-half (from 49 to 26 per cent.). This, again, is directly due to deforestation of the watershed. In consequence, the enormous expenditure (running into millions) on dams and irrigation works has largely been rendered futile. During the course of eight years the storing capacity of the Burrinjuck Dam, for instance, in New South Wales, has been reduced by 12,000,000 cubic feet—due entirely to the deposit of 500,000 tons of silt during that period.

But the evil does not end here. Forest lands act as purifiers and filters for the water supply of towns. Many cases are on record, not only in Australia, where by deforestation drinking water has become polluted; an excess of injurious bacteria and also of saline contents has resulted—much to the detriment of the consumers. The close connection between forest and city life is thus apparent. The latter cannot afford to disregard the natural value of the former.

Forests in Australia, as in other parts of the Empire, have been ruthlessly destroyed mainly to satisfy increasing demands of wood pulp for newspapers. It is on record that for one Australian "daily" 4 acres of virgin forest were sacrificed for each edition.

In Palestine, where soil is a precious commodity, a cloudburst recently carried away millions of tons of rich earth into the Mediterranean. This soil, which represented the accumulated wealth of hundreds of years, supported the growth of vast fruit and vegetable gardens; now nothing remains but a boulder-strewn waste. This disaster is largely due to Turkish maladministration in the past. The goat and the camel are commonly cited as initial offenders in this respect, but the truth is "man the destroyer" is the real culprit because, in grazing his animals he allows them to destroy the earth's vegetal cover.

From Canada also come tales of distress. Immense tracts of farm lands, from various causes, have been deprived of vegetation; droughts and floods defeat the farmers' efforts to make good. What can be the remedy?

Now there are many remedies for the evils of erosion. The most simple and effective include preservation of the soil's natural cover of trees and herbage; in short, by wise and provident methods of agriculture. When the "vegetational balance" is upset there is literally no limit to the chain of evils that result.

The most expensive and (in some cases) the most ineffectual are those involving the construction of huge dams and weirs with their highly paid staffs of hydro-technical engineers. This method, at any rate in the Union of South Africa, has been condemned by experts as tackling the problem "at the wrong end." The service of the botanist and the forester, they say, should be called before that of the engineer and the stonemason; in other words, the work of control should commence in watershed areas.

The soundest constructive criticism yet offered advocates the establishment of "geo-botanical" stations. By this means, with efficient organisation, the most suitable kinds of vegetation for "holding the soil" could eventually be selected. The sympathetic co-operation of the stockowner and the herdsman would, of course, be required; for overgrazing has always been the master key for the door of denudation.

Whilst it is true that erosion is the enemy of mankind, it is also the friend. It destroys, but it also creates. Rivers, for instance, often destroy life and property when they overflow, but at the same time they are depositing the detritus (or silt) which is to form the soil for future vegetation. The amount of erosive destruction by rivers, however, is greater at present than their value as soil producers, more especially in the less civilised parts of the Empire. That is the point. What is required therefore is a system of unified control and reckoning whereby a balance could be estimated and maintained; between the loss of arable lands by deforestation of watershed areas, on the one hand, and the formation of new lands, by desert reclamation, irrigation schemes, &c., on the other.

Now a favourable balance between revenue and expenditure is regarded by most Governments as essential to the well-being of any State; yet with regard to erosion, an increasingly adverse balance has accumulated in many countries, almost unheeded until recent times.

Erosion, if uncontrolled, becomes a formidable enemy; and it must be fought on all fronts. While nations sleep, its subtle advance continues unobserved. To arrest its pernicious progress unified control of all available forces must at all costs be established.

It may be asked: How can the ordinary layman help in the scientific control of erosion? The answer is by exercising his right as a voter, and by voting only for those candidates who will undertake to support anti-erosion measures in Parliament.

To deal adequately with so vast a subject as erosion, as it affects the Empire to-day, would demand much study and many volumes. In these remarks I have attempted merely to outline some of the dangers to which the arable lands, and the water supply, of the Empire are exposed at the present time.

True patriotism demands not only a call to arms to fight human aggression, but to stem the tide of the ever-encroaching forces of erosion. The greatest problem of all facing the Empire to-day is not political, nor racial, nor is it essentially defence by armaments; it is geological, for without arable lands and a good water supply the British Empire would soon cease to exist.

MAN THE DESTROYER.

Every traveller in Asia and Northern Africa is familiar with the remains of what were evidently once great cities, requiring vast supplies of food, situated in districts which are now incapable of feeding more than a few sheep or goats. Mr. Kennedy Shaw has described such finds in his series of articles on "Dead Libya." What is now desert was clearly once fertile country carrying a numerous and highly civilised population. It was thought at one time that the desiccation was the result of climatic charges. . . . The theory is now generally abandoned for the convincing reason that the process can be seen going on to-day as the plain result of man's own ignorance and lack of foresight in his treatment of the soil by which he lives. In America this rake's progress is particularly rapid, but it is not peculiar to America. . . . In South Africa, in parts of Australia and Canada, and in many other countries with seasonal rainfall it is a very serious menace. Owing to faulty land management valuable agricultural land in French and British Nigeria and in the French Sudan is being conquered and absorbed by the Sahara Desert at a rate estimated to exceed a kilometre a year.—"The Times."

According to Professor E. P. Stebbing, the Sahara has advanced 300 kilometres southward in three centuries. On this question of soil erosion much of great interest and value may be gleaned from a report (the Clarendon Press, 6s.) by Dr. MacLagan Gorrie, of the Indian Forestry Service, on his four months' survey in the United States on behalf of the Leverhulme Research Fund. He details the abuses of the land in California and elsewhere, and suggests that the proper agency for holding and developing land and preventing such abuses is a small but representative public body with sound technical advice at its disposal, and sufficient power to enforce its decisions. Private ownership and the common use of "waste" land have almost invariably overworked one use and neglected other possibilities, failing to develop the multiple use principle which can best serve the community as a whole. In the enormous areas of village grazing or common lands in British tropical countries, urgent action is necessary to prevent further misuse and conserve what is left of the soil's natural resources. Such action can obviously not be undertaken by the villagers themselves without some help from Government.

MIGRATION DEPENDS ON MARKETS.

In the course of a recent address to members of the Empire Parliamentary Association, in London, the Premier of Queensland, Hon. W. Forgan Smith, said that it was useless talking of mass migration to Queensland and in the same breath talking of the restriction of sales of Queensland products on overseas markets. Queenslanders' attitude towards migration would be determined by the capacity to sell migrants' products. Difficulties were being created by well-meaning people assuming that migration was a method of coping with unemployment.

"If we have reasonable prospects of selling our produce we will make land available under favourable conditions," said the Premier. He rebutted the question, "Why could not mass migrants live on their own products without depending on exports?"

VETERINARY MEDICINES ACT.

ANNUAL REGISTRATION, 1936.

First supplementary list—to be read in conjunction with list appearing on pages 282 to 285 of March Journal.

Registrations effected from 8th February to 20th March, 1936.

	Reg. No.
Armitstead, J., Warwick—	
Mawson's Horse Blister	230
Sheep Drench	231
Bryce Ltd., Brisbane—	
Pegavo	325
Butler and Co., Ltd., Edward, Brisbane—	
Eczema Ointment	1134
Collins, W. A., Cairns—	
Collins' Alterative Worm and Condition Powders	363
Veterinary Cough Paste	364
Dryden, Victor, Lutwyche—	
Victor Dryden's Blood and Water Powders for Horses and Cattle	28
Victor Dryden's Gripe Drench for Horses and Cattle	30
Finney, L. W., Brisbane—	
Telson Fluke Drench	88
Telson General Purpose Drench	89
Telson Poultry Powder	234
Finney and Ure Ltd., Hubert, Brisbane—	
Karswood Poultry Spice	58
Karswood Dog Condition Powders	317
Ganter Bros., Monto—	
F.G.B. Blood Scour Mixture	418
Hayes Veterinary Co., Brisbane—	
Cutter Blackleg Aggressin (Solid)	235
Hayes' Barbed Wire Liniment	236
Hayes' Cattle Blight Powders	237
Hayes' Condition Powders	238
Hayes' Lampas Lotion	239
Hayes' Mammitis Remedy	240
Hayes' Mange Ointment	241
Hayes' Redwater Cure	242
Hayes' Scour Powders	243
Hayes' Veterinary Ointment	244
Hayes' Udder Ointment	245
Hayes' Wart Lotion	246
Hayes' Worm Powders for Horses	247
Lung Worm Injection	248
Hayes' Cleansing Drench	251
Yohimbin	324
Kelly, R., Ayr—	
XL Powder for Scours in Calves	1110
XL Veterinary Application for Sores	1111
XL Veterinary Blistering Ointment	1112
XL Veterinary Colic Drench for Horses or Cattle	1113
XL Veterinary Embrocation for Horses or Cattle	1114
XL Veterinary Gall Ointment	1115
XL Veterinary Gripe Drench for Horses or Cattle	1116
XL Veterinary Healing Ointment	1117
XL Worm and Condition Powders	1118

Ling, H. J., Babinda—	
Hayden's Special Gripe Drench	321
Mactaggart's Primary Producers Co-op. Assn. Ltd., Brisbane—	
Kuso	77
Cutter Blackleg Antigen (Blacklegol)	78
Cutter Blackleg Aggressin (Solid)	131
Equinoint	132
Mactaggart's Carbon Tetrachloride Fluke and Worm Drench	228
Mactaggart's Special Medicated Stockholm Tar	1271
Moss and Co., T. W., Brisbane—	
Eclipsal	430
New Zealand Loan and Mercantile Agency Co., Ltd., Brisbane—	
Cooper's Improved Worm Tablets	85
Cooper's Lavene Animal Wash	86
Kur-Mange	87
Zealone A.H.P. Special Sheep Drench for Worms and Fluke	1120
Norris Agencies Ltd., Brisbane—	
CN. 25 per cent.	133
Sidolia	265
O'Reilly, R. (Agent, Parke Davis and Co.), Brisbane—	
Nema Worm Capsules	69
Blackleg Vaccine (Blacklegoids), Single	70
Blackleg Vaccine (Blacklegoids), Double	71
Tetanus Antitoxin	72
Worm and Fluke Drench Special	178
Parke Davis and Co's. Fluke and Worm Drench, Double Strength	179
Nema Worm Drench	180
Queensland Chemical Distributing Co., Brisbane—	
Vetrolene	135
Riddell, R. A., Brisbane—	
Aricyl (Bayer)	66
Odelyn (Bayer)	68
Murnil (Bayer)	1253
Row and Co., Rockhampton—	
Row's Barbed Wire Fence Liniment	63
Row's Cattle Eye Lotion	64
Row's Swamp Cancer Remedy	65
Surgical Supplies Ltd., Brisbane—	
Bio Blackleg Aggressin	258
Bio Blackleg Anaculture Vaccine	259
Bio Blackleg Pellets	260
Bio Pleuro Virus	261
Blackleg Cords (Bio)	262
Bio Mastitis Toxiculture	274
Bio Strangles Toxiculture	275
Blackleg Solid Aggressin (Bio)	332
Sapocarb	362
Tudor, H. G., Toowoomba—	
Condition Powders for Horses	165
United Chemical Co. Pty. Ltd., Brisbane—	
United Fluke and Worm Drench	229
United Concentrated Arsenic and Epsom Salts Liquid Drench	318
United Medicated Stockholm Tar	1270

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 2nd April, 1936, a ten minutes' talk, commencing at 7.5 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for April, May, June, July, and August, 1936:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Thursday, 2nd April, 1936.—''Tobacco Grading,'' Mr. T. Graham, Instructor in Agriculture.

Tuesday, 7th April, 1936.—''Registration of Stallions,'' Mr. J. W. Munro, Registrar of Stallions.

Thursday, 9th April, 1936.—''Paspalum Ergot,'' Mr. R. B. Morwood, M.Sc., Pathologist.

Tuesday, 14th April, 1936.—''The Development of the Poultry Industry,'' Mr. P. Rumball, Poultry Expert.

Thursday, 16th April, 1936.—''Some Aspects of Malnutrition in Dairy Cattle,'' Mr. J. C. J. Maunder, B.V.Sc., Government Veterinary Surgeon.

Tuesday, 21st April, 1936.—''Fodder Conservation, Central Queensland,'' Mr. N. E. Goodchild, Senior Instructor in Agriculture.

Thursday, 23rd April, 1936.—''The Identification of Pigs,'' Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 28th April, 1936.—''Storage of Seeds and Grain,'' Mr. F. B. Coleman, Officer in Charge, Seeds and Stock Foods Investigation Branch.

Thursday, 30th April, 1936.—''Winter Care of Market Pigs,'' Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 5th May, 1936.—''The Rural Assistance Board and its Functions,'' Mr. A. Gray, Agricultural Bank.

Thursday, 7th May, 1936.—''Pasture Mixtures,'' Mr. C. W. Winders, B.Sc.Agr., Assistant in Agronomy.

Tuesday, 12th May, 1936.—''The Rural Assistance Board and its Functions,'' Mr. A. Gray, Agricultural Bank.

Thursday, 14th May, 1936.—''The Economic Use of Licks in the Sheep-grazing Industry,'' Mr. J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 19th May, 1936.—''Pests of Seed Beds,'' Mr. J. A. Weddell, Entomologist.

Thursday, 21st May, 1936.—''The Prospects of the Fruitgrowing Industry in Queensland,'' Mr. H. Barnes, Director of Fruit Culture.

Tuesday, 26th May, 1936.—''The Suitability of Sheep-farming Areas,'' Mr. J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 28th May, 1936.—''The Value of New Cultivation for Cotton-growing,'' Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 2nd June, 1936.—''Fiji Disease in Southern Queensland,'' Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Thursday, 4th June, 1936.—''Pigs for Pork and Pigs for Bacon,'' Mr. L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 9th June, 1936.—''Some Peculiar Feeding Habits of Stock and what they Indicate,'' Mr. W. R. Winks, B.Sc., A.A.C.I., Analyst.

Thursday, 11th June, 1936.—''Cotton Varieties for Alluvial Soils,'' Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 16th June, 1936.—"Cotton Varieties for Hill Slopes," Mr. W. G. Wells, Director of Cotton Culture.

Thursday, 18th June, 1936.—"Artificial Incubation," Mr. J. J. McLachlan, F.B.S.A., Poultry Inspector.

Tuesday, 23rd June, 1936.—"Cane Irrigation," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Thursday, 25th June, 1936.—"Citrus Pruning in Queensland," Mr. R. L. Prest, Instructor in Fruit Culture.

Tuesday, 30th June, 1936.—"Transferring Bees," Mr. H. Hacker, F.R.E.S., Entomologist.

Thursday, 2nd July, 1936.—"Dategrowing in Queensland," Mr. H. J. Freeman, Senior Instructor in Fruit Culture.

Tuesday, 7th July, 1936.—"Interpretation of Labels attached to Stock Foods," Mr. R. A. Taylor, Inspector and Examiner, Fertilizers Branch.

Thursday, 9th July, 1936.—"The Giant Toad," Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Tuesday, 14th July, 1936.—"Amended Regulations of the Dairy Produce Acts," Mr. G. B. Gallwey, Inspector of Accounts, Dairy Branch.

Thursday, 16th July, 1936.—"The Breeding of New Cane Varieties," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Tuesday, 21st July, 1936.—"The Use of Drugs in the Treatment of Parasitic Worms," Dr. F. H. S. Roberts, Entomologist and Parasitologist.

Thursday, 23rd July, 1936.—"The Production of Choice Quality Cream," Mr. O. St. J. Kent, Dairy Research Laboratory.

Tuesday, 28th July, 1936.—"Fungi which Assist the Growth of Plants," Mr. H. E. Young, B.Sc.Agr., Assistant Plant Pathologist.

Thursday, 30th July, 1936.—"Herd Recording," Mr. L. Anderson, Dairy Instructor.

Tuesday, 4th August, 1936.—"A Plea for the Tree," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 6th August, 1936.—"Timber Trees on the Farm," Mr. W. D. Francis, Assistant Botanist.

Tuesday, 11th August, 1936.—"Rotation of Crops." Mr. H. W. Ball, Assistant Experimentalist.

Thursday, 13th August, 1936.—"The Problem of Prices," Mr. J. F. F. Reid, Editor of Publications.

Tuesday, 18th August, 1936.—"Some Ways of the Soil," Mr. J. L. Foran, Analyst.

Thursday, 20th August, 1936.—"Some Plants Poisonous to Poultry and Pigs," Mr. C. T. White, Government Botanist.

Tuesday, 25th August, 1936.—"Our Debt to Denmark," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 27th August, 1936.—"The Tick Fever of Cattle in Queensland," Mr. C. R. Mulhearn, B.V.Sc., Government Veterinary Surgeon.

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WHAT THE YELLOW WRAPPER MEANS.

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PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, and the Jersey Cattle Society, production charts of which were compiled during the month of February, 1936 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Model 2nd of Alfavale	W. H. Thompson, Nanango	12,852·6	618·70	Reward of Fairfields
Glengallon Sadie	R. Tweed, Kandanga	10,230·05	431·773	Nobleman of Blacklands
Deb 2nd of Kia Ora	Mrs. J. Weber, Peak Crossing	9,999·95	396·28	Red Knight of Greyleigh
Happy Valley Venture Queen	R. R. Radel, Coalstoun Lakes	10,987·94	376·927	Venture of Happy Valley
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Model 3rd of Alfavale	W. E. Thompson, Nanango	13,758·85	582·707	Reward of Fairfields
Kyabram Rosette	A. H. Black, Kumbia	8,962·7	334·844	Ledger of Greyleigh
	JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.			
Springlands Duchess	W. G. Marquardt, Wondai	13,768·65	538·507	Boss of Hillview
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Springland Dot	W. G. Marquardt, Wondai	12,726·1	515·082	Boss of Hillview
Headland Perfect III.	J. A. Heading, Cloyna, Murgon	10,502·97	442·232	Jellicoe of Duchesses Fairfield
Home Hill Doris III.	A. E. Althouse, Cloyna	8,875·72	355·757	Waiter of Sunnymeade
Lady Mabbelle of Blacklands	A. Pickels, Wondai	8,202·9	343·02	Limelight of Parkview
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Rhodesview Fairy 12th	W. Gierke and Sons, Helidon	7,211·21	303·326	Red Knight of Rhodesview
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Glenore Cherry	A. M. Johnson, Gracemere	9,717·05	420·796	Sunnyview Union Jack
College Flight	Queensland Agricultural High School and College, Gatton	7,137·43	300·825	Duplex of Greyleigh
College Thorn	Queensland Agricultural High School and College, Gatton	7,729·89	289·893	Premier 2nd of Hillview

	Junior, 2 Years (under 2½ Years), Standard 230 Lb.			
College Gold 2nd	Queensland Agricultural High School and College, Gatton	11,298·35	439·833	Premier of Hillview
Highfield Caroline II.	J. A. Heading, Cloyna	9,263·62	414·648	Kalunya Bruce
Blacklands Jeannette 12th (245 days)	A. M. Johnson, Gracemere	9,369·3	395·002	Parkview Limelight
Happy Valley Vision Express	R. R. Radel, Biggenden	6,870·79	290·607	Barradale Emperor
	JERSEY.			
	Mature Cow (over 5 Years), Standard 350 Lb.			
Avonreen of Southport	H. J. Gibson, Kingaroy	6,664·45	384·249	Werribee Twylish Starbright King
	Senior, 4 Years (over 4½ Years), Standard 330 Lb.			
Elden Olga	J. B. Keys, Gowrie Little Plain	7,124·84	402·196	Retford Raleigh Chief
	Junior, 4 Years (under 4½ Years), Standard 310 Lb.			
Monica of Calton	E. Burton and Sons, Wanora	7,632·25	403·599	Prince Clair of Calton
	Senior, 2 Years (over 2½ Years), Standard 250 Lb.			
Choice of Hamilton	J. Wilton, Raceview	5,699·61	322·834	Retford Mays Victor
	Senior, 2 Years (over 2½ Years), Standard 250 Lb.			
Oxford June	W. Spresser and Sons, Redbank	4,225·79	263·577	Oxford Ginger Boy
	Junior, 2 Years (under 2½ Years), Standard 230 Lb.			
Lermont Belle	J. Schull, Oakey	4,882·76	258·566	Trecarne Fern Lad
Lermont Lynette	J. Schull, Oakey	4,242·46	230·994	Myrtle's Pride of Lermont

PLATE 159.

CABINETWOOD LOGS AT A NORTH QUEENSLAND DEPOT.

Logs for cutting into decorative veneers and fine timber for furniture are here illustrated. Logging from Crown forests in North Queensland during 1934-35 easily broke all records, approximately 21,000,000 superficial feet being sold, as against 8,500,000 in 1933-34.

[*Photo. by courtesy Telegraph Newspaper Co., Ltd.*

PLATE 160.

A FLOURISHING PLANTATION OF HOOP AND BUNYA PINE (BUNYA IN FOREGROUND).

1,400,000 trees of all species (majority Hoop Pine) were planted out by the Queensland Forest Service during the year 1934-35. [*Photo. by J. A. Lunn.*

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Guinea Grass.

F.A.S. (Mundubbera)—

The specimen represents Guinea grass, *Panicum maximum.* We noted with interest what you say about this grass compared with blue panic grass. We think, like this latter grass, it is well worth having a small paddock of it for periodical eating-off. Cattle seem very fond of it, but if left to grow without eating-off it is liable to become very coarse.

Three-pronged Spear Grass.

H.S.B. (Mundubbera)—

The grass is, we think, *Aristida Leichhardtiana,* a species of three-pronged spear grass which we have not previously received for our collections. We were very pleased to receive this specimen. Half of the material is being sent to Mr. Hubbard, at Kew, England, for check determination.

"Asthma Plant"—Pigweed.

I.B. (Boonmoo, Chillagoe Line)—

The plant like Hervea is *Euphorbia pilulifera,* the asthma plant. This herb is dried and made into tea and is said to give relief in asthma, but we have not heard of its being effective in rheumatism before, and your note has been read with much interest.

The Pigweed is *Portulacca oleracea,* a plant widely spread in one form or another over the warm regions of the world, and it makes quite good "spinach," although we think we have some herbs that are rather better.

We will always be pleased to name and report on any specimens you care to send.

Giant Couch.

A.K.K. (Maleny)—

The specimen represents *Brachiaria mutica,* better known in Queensland as *Panicum muticum,* giant couch. This grass is spread widely over most of the tropical and subtropical countries and in parts of North Queensland, such as on the Daintree River and the wetter parts of Atherton Tableland. There is no doubt it is a very valuable grass. Stock are particularly fond of it. It does remarkably well under cultivation, and a small paddock of it for feeding off has a good carrying capacity. The grass does not seed very readily, but roots put in during the early summer make very rapid growth. It suffers badly from frost during the winter months.

Rattlepods.

V.L.McL. (Colosseum)—

The plants are all species of rattlepods. Members of this genus, *Crotalaria,* both in Australia and abroad, have been proved poisonous to stock. On the other hand, some species are eaten without any ill effects. Of the three you send, No. 1 is the only one definitely proved poisonous by feeding tests, but as suspicion falls on all of them it would be just as well to get rid of the others if possible. Individual determinations:—

1. *Crotalaria striata,* widely spread over the tropics and subtropics of the world, and in India is much grown as green manure for tea. It is very abundant in Queensland and in parts of Northern Territory, and feeding tests show it to be poisonous.
2. *Crotalaria Mitchellii,* which is very common, but nothing is known about its properties.
3. *Crotalaria trifoliastrum.* This has been accussed of poisoning stock, particularly horses, but no definite information is available.

Rag Weed.

S.C. (Crow's Nest)—

The specimen represents *Ambrosia psilostachya*, a species of rag weed. It is a native of Mexico and the Southern and Western United States. In the latter country it is known as Western rag weed to distinguish it from some of those found in the Eastern States. It is also known as perennial rag weed on account of the perennial root. The plant is said to be rather a bad weed in the United States and to invade all classes of crops. It has not been met with previously in Queensland, but in America it is recommended that newly invaded areas should have prompt treatment with a strong weedicide, caustic soda, or strong brine, the soil being cleared of all plant growth for a season rather than allowing the pest to gain a foothold. Larger areas it is said can be suppressed eventually by cultivation methods, and in most plants with an underground root system, an attempt being made to prevent leaf growth and thus starving underground portions. The plant is not known to possess any poisonous or harmful properties.

Western Plants Identified.

D.F.S. (Cunnamulla)—

1. *Morgania floribunda*, very common in Western Queensland, although we have heard no common name for it. Its properties are unknown; however, it is not known to be poisonous or harmful in any way.
2. *Paspalidium flavidum*, Warrego summer grass. It is generally regarded as a very nutritious and palatable species.
3. *Erigeron longifolius*, commonly known as rag weed, sometimes as cobbler's pegs, but on the coast this latter name is more generally given to another plant of the same family. It is more a coastal weed than a weed of the inland.
4. *Trianthema crystallina*, a plant allied to the pig weeds which is very common in Western Queensland. It is probably quite a good fodder. We have heard no common name applied to it.
5. *Chloris scariosa*, one of the native grasses often called windmill grass. Most of the chlorises are good fodder, making a good bottom, particularly for sheep. This species, however, is not as good as many of the others.
6. *Bassia bicornis*, goat head burr, a plant allied to the galvanised burr.
7. *Abutilon otocarpum*, a plant of the mallow family, for which we have not heard a common name. It is probably quite a good fodder.
8. *Ochinochloa crus-galli*, often called wild millet. It is a good fodder, being related closely to such well-known cultivated crops as Japanese millet and white panicum.
9. *Malvastrum spicatum*, a very common weed of the mallow family in Western Queensland, but for which no common name is known. It has been suggested that it might be associated with staggers or shivers in sheep that occurs spasmodically in the Warrego district, but proof is lacking.
10. *Triraphis mollis*, sometimes called plume grass. It is not generally regarded as a particularly good fodder.

11. *Chloris pectinata* 12. *Chloris acicularis*	These two chloris grasses are very abundant throughout the West and mid-West. They are regarded as excellent grasses responding well to early rains and making quite a good bottom for sheep.

13. *Tragus racemosus*, small burr grass.
14. *Solanum esuriale*, potato bush.
15. *Sporobolus actinocladus*, a common grass in Western Queensland, but we have heard no common name applied to it.
16. *Epaltes australis*, a common plant of the composite or daisy family; both in Coastal and Western Queensland. It is not known to possess any poisonous or harmful properties.
17. *Aster subulatus*, a North American weed now naturalised in Queensland. It it more common on the coast than inland, and in the Moreton district, Burnett district, &c. It mostly occurs as a weed of wet, damp places, but is not often found in the ordinary pasture.

Near Western Grasses Identified.

L.F.M. (Canaga, via Chinchilla)—

1. *Paspalidium distans, Paspalidium gracile.* These are species of brigalow grass. They are exceptionally good grasses and are fairly common on brigalow country, and usually come in naturally after the brigalow is cleared.
2. *Dactyloctenium radulans,* button grass. A very good natural grass which is a rapid grower, and stock eat it readily when it is dried in somewhat the same way as Flinders grass.
3. *Tragus racemosus,* small burr grass.
4. *Eremochloa bimaculata,* poverty grass. Generally occurs on sandy country, particularly under cabbage gum or rusty gum. It is generally regarded as having poor fodder properties.
5. *Cymbopogon refractus,* barbed-wire grass. A very coarse species, not of much value as a fodder.
6. *Eragrostis* sp. A love grass.
7. *Eragrotis parviflora,* weeping love grass.
8. *Eragrostis leptostachya,* paddock love grass.
9. *Eragrostis concinna,* a love grass.

   The love grasses are of secondary value, but are rather useful in the average mixed native pasture.
10. *Bothriochloa decipiens,* bitter or pitted blue grass, or as it is sometimes called in New South Wales, red leg. This grass has a very bitter flavour. It is of little value as a fodder. It generally comes in in abundance when the palatable grasses are eaten out.
11. *Aristida glumaris,* a three-pronged spear grass. This is not of much value as a fodder.
12. *Aristida* sp.
13. *Setaria surgens,* pigeon grass. Quite a good fodder.
14. *Eleusine Indica,* crowfoot grass. It is readily eaten by stock and mostly occurs round cow yards, old cultivation paddocks, &c., or anywhere where the ground has been disturbed. At times it contains a prussic-acid-yielding glucoside, but losses in Queensland are rare. Occasionally calves are poisoned by it.
15. *Diplachne fusca,* a grass of rather wet places, for which we have not heard a common name. In certain situations it has some value as a fodder.
16. *Sporobolus elongatus,* rat's tail grass. It is not a good fodder.
17. *Cynodon dactylon,* common couch, a valuable fodder.
18. *Chloris ruderalis,* a star grass. Most of the chloris grasses are valuable fodders, particularly on cleared brigalow and belah country, and they are one of the first to respond to early rains.
19. *Panicum effusum,* a native panic grass, very common on the lighter sandy soils, and in such places quite good fodder.
20. *Perotis rara,* comet grass. Not a very good fodder.
21. *Eriachne* sp., not particularly good fodder, but somewhat useful in the mixed pasture.
22. *Digitaria* sp. Quite a good fodder.
23. *Stenophyllus barbatus, Fimbrystylis diphylla.* Two sedges in the bundle. These grow in various situations, but mostly in sandy country overlying clay. Although they have not the fodder value of grasses they probably supply a bit of feed where better fodder is lacking.

Beans.

D.M. (Nanango)—

The specimen represents one of the forms of *Phaseolus lunatus,* but beans and seeds are really necessary to tell the exact variety, as it is the marking on the seeds that distinguishes the varieties. The common lima bean is a variety with pure white seeds, while the Madagascar bean has white seeds splashed with red. Both of these are, of course, edible—either the green seeds fully formed and not hard, or the dried seeds. There is another variety of bean grown in Queensland, known as the pink Mauritius. This has red seeds and is poisonous, but the poisonous component, a prussic-acid-yielding glucoside, is driven off more or less by heating.

Wallaville Specimens Identified.

A.G.S. (Project Club, Perry River, via Wallaville)—

1. *Lespedeza sericea,* Korean clover. This was boomed as a fodder in many countries, particularly in the United States. It is grown here now on a small scale, but our experience with it is that it is rather woody.
2. *Crotalaria juncea,* a species of rattle-pod. It is a native of Queensland, but is found in other tropical countries, and in India is grown for fibre under the name of sun hemp. Stock seem fond of it in spite of the fact that some members of the genus have been accused of poisoning.
3. *Cassia mimisoides,* a small legume very common in the average native mixed pasture in many parts of Queensland.
4. *Euphorbia Macgillivravi,* a native plant; we know very little of its properties.
5. *Eragrostis* sp.
6. *Cenchrus australis,* burr grass. It is frequently known in many parts of Queensland by the absurd name of Scotch Lice. Sometimes flies and other insects get trapped in the burr-like spikelets or seeds.
7. *Cyperus* sp., a sedge.
8. *Eragrostis megalosperma,* a species of love grass rather different from most others of the genus. It most frequently occurs on the edge of scrubs or comes up naturally after the scrub has been felled.
9. *Eragrostis leptostachya,* paddock love grass.
10. *Cymbopogon refractus,* barbed-wire grass.
11. *Setaria surgens,* pigeon grass.
12. *Arundinella hispida,* a very coarse grass.
13. *Tribulus terrestris,* caltrops, also known as cat head, bull head, goat head, names which are indiscriminately applied to many burrs in the West. In South Africa is causes in ''big head'' a disease of sheep, but we have had no trouble with it here in Queensland, and feeding tests here have given negative results. It is widely spread in many of the warm temperate regions of the world.
14. *Swainsona galegifolia,* Darling pea, or indigo. When eaten to any extent by stock, particularly sheep, this plant causes a peculiar form of poisoning. The active principle of the plant has not been isolated, but it apparently destroys the nerve endings and the animal becomes stupid and may walk into fences, stumps, &c. The symptoms are not manifested until after six to eight weeks of feeding on the plant, but sheep once they start soon become confirmed Indigo eaters.

"The Wheel of Fire."

A.H.B. (Nambour)—

The specimen represents the Wheel of Fire, *Stenocarpus sinuatus,* a native of the scrubs of Coastal Queensland and Northern New South Wales. It is one of the most beautiful of our flowering trees, and is propagated from seed. Although widely distributed it is not very common in scrubs and is not often cut. The Forestry Department has adopted the official name of white oak for the timber.

Coloration of Animals.

J.S. (Gatton)—

The Senior Instructor in Pig Raising, Mr. E. J. Shelton, advises that the progeny of a purebred Large or Middle White (Yorkshire) boar is invariably of white colour when they are produced by a Berkshire sow, and *vice versa;* but where the White breeds are crossed with Tamworths, Wessex Saddlebacks, or Large Black breeds it is not uncommon for some of the progeny to have red, black, or bluish markings, respectively, even if the sire of the pigs is a purebred registered animal. It is difficult to account for this, but the facts are as stated.

In your case it is evident the sow you have carries Large Black and Wessex Saddleback blood, even though she is black in colour herself; hence it is no indication that the boar used is not purebred when some of the progeny show black skin spots. The progeny of a Large or Middle White (Yorkshire) boar when mated to a Large Black sow (or *vice versa*) are almost always bluish-grey in colour, and in the case of a Tamworth sow it is not unusual for some of the young pigs to have red markings.

The subject is an interesting one, and if you desire to make a further study of the coloration of animals we refer you to the textbook, ''Animal Breeding,'' by Shaw, which can be obtained at approximately 15s. from booksellers in the city.

General Notes

Staff Changes and Appointments.

Messrs. M. R. Irving and P. F. A. Hardman, Government Veterinary Surgeons, Department of Agriculture and Stock, Brisbane, have been transferred to Rockhampton and Gympie, respectively.

Constable W. T. Hibbett, Jandowae, has been appointed also an Inspector under the Slaughtering Act.

Mr. B. N. Choice, Goondiwindi, has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. R. E. Churchward, B.V.Sc., Veterinary Surgeon, Department of Agriculture and Stock, Townsville, has been transferred to Cloncurry.

Constable Wm. Neil, Ravenswood, has been appointed an Inspector of Slaughterhouses.

Messrs. R. E. Churchward, B.V.Sc., P. F. A. Hardman, B.V.Sc., and M. R. Irving, B.V.Sc., veterinary surgeons on probation, Department of Agriculture and Stock, have been appointed also inspectors under the Diseases in Stock Acts, the Dairy Produce Acts, and the Slaughtering Act, as from the 21st March, 1936.

Constable J. S. Harper, of St. George, and Acting Sergeant R. V. Carter, of Roma, have been appointed also Inspectors of Brands as from the 21st March, 1936.

The resignation of Mr. K. V. Doherty as Acting Inspector of Stock at Maryvale has been accepted.

Mr. A. H. W. Cunningham, Strathmore Holding, Collinsville, has been appointed an honorary ranger under the Animals and Birds Acts, as from the 21st March, 1936.

Mr. M. T. Keating, Superintendent of Green Island, via Cairns, has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act, as from the 21st March, 1936.

Mr. J. Bishop, Inspector of Stock, Dairies, and Slaughterhouses at Kingaroy, has been transferred to Proston.

Messrs. L. A. Jacobsen (North Kolan, via Avondale) and C. C. A. Herman (Kolan River South, via Bucca) have been appointed Honorary Rangers under the Animals and Birds Acts, as from the 7th March, 1936.

Applications under the Farmers' Assistance (Debts Adjustment) Act of 1935.

A Proclamation has been issued under "*The Farmers' Assistance (Debts Adjustment) Act of* 1935" fixing the 30th June, 1936, as the date within which any farmer who proposes to effect a composition or scheme of arrangement with creditors in satisfaction of whole or part of his debts and/or liabilities, whether secured or unsecured, may make application to the Rural Assistance Board for assistance to give effect to such composition or scheme.

Queensland Cane Growers' Council.

A Regulation has been issued under the Primary Producers' Organisation and Marketing Acts, providing that at the election in March, 1936, each mill suppliers' committee, district cane growers' council, and the Queensland Cane Growers' Council shall be elected for three years, that is, until the 31st March, 1939.

Plywood and Veneer Board.

An Order in Council has been issued in pursuance of the provisions of "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1935," extending the operations of the Plywood and Veneer Board from 3rd May, 1936, to 2nd May, 1939.

A petition was invited for a poll on the question of the continuance or otherwise of the pool, but as none was received within the specified time the above order has been issued formally.

Animals and Birds Sanctuary near Collinsville.

An Order in Council has been issued under the Animals and Birds Acts, declaring portion of Strathmore Holding, Collinsville, which embraces Campbell's Camp and Callaghan's Swamp, to be a sanctuary for the protection of native animals and birds. Mr. A. H. W. Cunningham, of Strathmore, is an honorary ranger under the Acts.

Federal Fertilizer Subsidy.

Forms of application for subsidy on artificial manure used during the year ending 30th June, 1936, have been distributed throughout the Commonwealth, and supplies may be obtained at all Post Offices.

Provision is made in *The Primary Producers Relief Act*, 1935, for the payment by the Commonwealth of a subsidy at the rate of 15s. per ton on artificial manure used during the period 1st July, 1935, to 30th June, 1936, in the production of primary products other than wheat. Payment of the subsidy is made in respect of complete ton or half-ton lots only, other fractions of a ton being excluded.

Many primary producers in previous years have been under the impression that the subsidy is payable on quantities purchased. This impression is erroneous, and has led to much confusion and delay in dealing with claims. It should be noted that the subsidy is payable only on artificial manure used—that is, applied to the soil—during the period 1st July, 1935, to 30th June, 1936.

The Primary Producers Relief Act, 1935, defines artificial manure as—

> "Any substance which contains nitrogen, phosphoric acid, or potash, which has been manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants."

It does not include any animal or vegetable matter which has not been subjected to process or manufacture; or agricultural lime or other soil amendment or any product prepared primarily for supplying lime to the soil.

If producers are unable to obtain the forms at their local post office, they may procure same on application to the Officer in Charge of the Fertilizer Section, Department of Commerce, Box 778L, G.P.O., Brisbane.

After completing all the particulars required on the form, the applicant should send it to the supplier of the fertilizer for completion of the Supplier's Certificate and transmission of the claim to the department at the address previously mentioned for payment.

The Act provides that applications must be lodged with the Secretary, Department of Commerce, on or before 31st October, 1936. Any applications lodged after that date will be ineligible for participation in the subsidy.

Fruit Marketing Organisation Acts.

An Order in Council has been issued under the Fruit Marketing Organisation Acts extending the operations of the Fruit Marketing Organisation Acts until the 31st December, 1939. Notice of intention to make the above Order was published on the 19th December last, and a requisition for a ballot on the question of the continuance of the Acts was invited, to be lodged by the 31st January. No such requisition was received, and the Acts have now been extended formally.

Canary Seed Board.

An Order in Council has been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, giving notice of intention to extend the operations of the Canary Seed Board for a further period of three years from 1st June, 1936, to 31st May, 1939. A petition for a ballot on the question of whether or not the Pool should be continued for such period may be lodged, by not less than ten per cent. of the growers of canary seed, on or before the 27th April next.

Sugar Cane Assignment.

Executive approval has been given to the issue of Orders in Council in pursuance of the provisions of the Regulation of Sugar Cane Prices Acts declaring the assignments of lands of canegrowers to sugar mills throughout Queensland.

Open Season for Duck and Quail throughout Queensland.

An Order in Council has been issued under the Animals and Birds Acts fixing the open seasons for duck and quail throughout Queensland during the present year.

The effect of this Order in Council is to fix the open season for duck in Southern Queensland from the 1st April to the 31st August next, and for quail in the same area, from the 1st May to the 30th September next.

The open season for duck and quail in Central Queensland has been fixed from the 1st July to the 30th November next, and in Northern Queensland, from the 1st June to the 31st October next.

Conditions Governing the Making of Wine for Sale.

A grower of fruit, i.e., oranges, pines, mulberries, and plums, is permitted by law to make wine from these fruits, with the addition of sugar, and sell same to the public. Such wine must not contain more than 40 per centum of proof spirit by volume.

A license to sell or to manufacture wine from the abovementioned fruits is not required. It is illegal, however, to make wine from the juice of the grape, containing added sugar, honey, glucose or other sweetening matter, without first obtaining the necessary manufacturer's license, which costs £20 per annum, from the Customs Department. Wine made from the juice of the grape, with the addition of tho ingredients mentioned, is subject to 20s. per gallon duty.

A grower and maker of wine is permitted to sell wine made by him in any quantity at the premises where it is grown or made, but the sale of such wine in quantities of less than two gallons at one time elsewhere than on the premises where it is grown or made is prohibited.

There is not any restriction as regards the hours of sale during the six business days of the week by a grower and maker of wine, but the sale of any such wine on Christmas Day, Good Friday, Sunday, or Anzac Day is prohibited.

The use of fortifying liquor, such as brandy, whisky, rum, or grape wine, is permitted, but, as already mentioned, ''wine'' must not contain more than 40 per centum of proof spirit by volume.

It is not necessary to guarantee home-made wine under ''The Pure Foods Regulations'' of ''*The Health Acts*, 1900 *to* 1931.'' Inquiries made at the Health Department elicited the information that there is not any standard as regards the purity of foodstuffs. ''Food'' is either fit or unfit for human consumption. If impure, and therefore unfit for consumption, a prosecution would, of course, be launched by the Health Department. It would be advisable for fruitgrowers making wine to forward a sample to the Health Department, South Brisbane, for analysis.

Local Cane Prices Boards.

His Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of ''*The Regulation of Sugar Cane Prices Acts*, 1915 *to* 1935,'' doth, by this notice, appoint the following persons as representatives of the owner or owners of the mill, and as representatives of the canegrowers, to be members of the respective Local Boards hereinafter specified, and has been pleased to appoint the persons so designated as Chairman therof respectively:—

Babinda Local Board.—Millowners' Representatives: F. A. Lamont and W. J. Ryan. Canegrowers' Representatives: S. H. Warner and D. O. James. Chairman: A. Anderson.

Bingera Local Board.—Millowners' Representatives: B. A. Bourke and Dr. A. J. Gibson. Canegrowers' Representatives: F. J. Wheeler and C. W. Thiele. Chairman: A. E. Aitkin.

Cattle Creek Local Board.—Millowners' Representatives: P. H. McLean and G. W. Shaw. Canegrowers' Representatives: W. G. Merrill and F. W. Valentine. Chairman: A. V. C. Smith.

Fairymead Local Board.—Millowners' Representatives: T. W. Pulsford and E. W. Scott. Canegrowers' Representatives: P. E. Scotney and F. J. Wheeler. Chairman: A. E. Aitkin.

Farleigh Local Board.—Millowners' Representatives: W. B. Fordyce and John Smith. Canegrowers' Representatives: P. Kirwan and T. G. Mulherin. Chairman: T. R. Kennedy.

Gin Gin Local Board.—Millowners' Representatives: W. C. Cunningham and H. G. Mittelheuser. Canegrowers' Representatives: J. Laurison and G. Powell. Chairman: A. E. Aitkin.

Goondi Local Board.—Millowners' Representatives: J. R. Kerr and D. A. Williams. Canegrowers' Representatives: W. D. Davies and H. T. Stone. Chairman: W. Rillie.

Hambledon Local Board.—Millowners' Representatives: A. H. Edwards and L. M. Smith. Canegrowers' Representatives: A. W. Browne and J. Moore. Chairman: A. Anderson.

Inkerman Local Board.—Millowners' Representatives: W. Gibson and D. Watt. Canegrowers' Representatives: S. W. Gibson and W. F. Klaka. Chairman: A. M. Taylor.

Invicta Local Board.—Millowners' Representatives: H. B. Burstall and J. L. Mullins. Canegrowers' Representatives: H. F. Hecht and W. E. G. Smith. Chairman: A. M. Taylor.

Isis Local Board.—Millowners' Representatives: A. Adie and J. Alison. Canegrowers' Representatives: B. Foley and A. W. Macpherson. Chairman: J. G. Fitzsimon.

Kalamia Local Board.—Millowners' Representatives: R. K. Calcutt and J. W. Inverarity. Canegrowers' Representatives: J. Breen and M. A. Coyne. Chairman: A. M. Taylor.

Macknade Local Board.—Millowners' Representatives: N. S. Beatty and A. J. West. Canegrowers' Representatives: G. Cantamessa and T. J. McMillan. Chairman: C. B. Buxton.

Marian Local Board.—Millowners' Representatives: A. J. Coyne and J. O'Neill. Canegrowers' Representatives: G. Ollett and E. C. Walz. Chairman: T. R. Kennedy.

Maryborough Local Board.—Millowners' Representatives: T. Braddock and O. C. Kinne. Canegrowers' Representatives: J. J. Leather and H. Doss. Chairman: J. A. Murray.

Millaquin Local Board.—Millowners' Representatives: G. S. Moore and E. P. Wyllie. Canegrowers' Representatives: F. Courtice and F. J. Wheeler. Chairman: A. E. Aitkin.

Moreton Local Board.—Millowners' Representatives: G. F. Scott and W. M. Whalley. Canegrowers' Representatives: Wm. Kittle and A. E. Williams. Chairman: T. P. Shanahan.

Mossman Local Board.—Millowners' Representatives: W. H. Crawford and E. J. O'Brien. Canegrowers' Representatives: R. D. Rex and N. H. Wellard. Chairman: T. W. Foran.

Mount Bauple Local Board.—Millowners' Representatives: T. Beattie and G. Greathead. Canegrowers' Representatives: W. J. Douglas and H. Jeppesen. Chairman: J. A. Murray.

Mourilyan Local Board.—Millowners' Representatives: G. R. Blair and H. G. Selby. Canegrowers' Representatives: E. S. Edgerton and B. B. Ross. Chairman: W. Rillie.

North Eton Local Board.—Millowners' Representatives: N. F. Lever and S. H. Scougall. Canegrowers' Representatives: P. E. Neilsen and T. P. Ross. Chairman: A. V. C. Smith.

Pioneer Local Board.—Millowners' Representatives: B. C. J. Martin and C. S. Wynter. Canegrowers' Representatives: B. S. Donovan and L. W. J. Hoey. Chairman: A. M. Taylor.

Plane Creek Local Board.—Millowners' Representatives: D. Greetham and A. Innes. Canegrowers' Representatives: C. W. Davidson and J. Lawrie. Chairman: T. R. Kennedy.

Pleystowe Local Board.—Millowners' Representatives: W. F. Clarke and G. M. Smith. Canegrowers' Representatives: M. W. R. Bowman and C. McKinley. Chairman: T. R. Kennedy.

Proserpine Local Board.—Millowners' Representatives: M. R. Gibson and R. Shepherd. Canegrowers' Representatives: H. W. Holmes and C. C. Robinson. Chairman: C. A. K. Morrison.

Qunaba Local Board.—Millowners' Representatives: G. S. Moore and W. A. Shield. Canegrowers' Representatives: G. E. Maughan and E. C. Rickert. Chairman: A. E. Aitkin.

Racecourse Local Board.—Millowners' Representatives: N. Bennett and A. S. Hamilton. Canegrowers' Representatives: R. S. Stevens and A. Turner. Chairman: A. V. C. Smith.

Rocky Point Local Board.—Millowners' Representatives: W. H. Heck and F. W. Heck. Canegrowers' Representatives: B. A. Ernst and H. W. Koppen. Chairman: J. J. Leahy.

South Johnstone Local Board.—Millowners' Representatives: F. Gillan and F. H. Gilmore. Canegrowers' Representatives: W. J. Henderson and R. J. Wright. Chairman: W. Rillie.

Tully Local Board.—Millowners' Representatives: C. P. Kemmis and F. N. King. Canegrowers' Representatives: P. Byrne and J. A. Winter. Chairman: W. Rillie.

Victoria Local Board.—Millowners' Representatives: R. T. Challinor and N. R. Dowling. Canegrowers' Representatives: E. L. Burke and G. G. Venables. Chairman: C. B. Buxton.

Rural Topics

Beef, Milk, and Butter in a Single Breed.

From the Secretary of the Red Poll Cattle Society:—

At the last show of the Smithfield Club, at Islington, the breed champion, which was also reserve champion at Norwich, not only proved an ideal butcher's carcass, but this animal, a two years nine months old heifer weighing 17 lb. in excess of 13 cwt., was the daughter of a 1,000-gallon cow, with a butter fat of 4.1 per cent. This champion heifer was the granddaughter of a cow that yielded over 37½ tons of milk, having averaged over 9,000 lb. a year with her nine calves.

The reserve champion, which was the second prize heifer and the Norwich champion, scaled 13½ cwt. for her two years seven months. This heifer was the heaviest in her class, and was out of a good milk dam. She had as her granddam a cow that averaged a 1,000 gallons with nine calves.

The winner under two-years-old steer scaled nearly 12½ cwt. for his twenty months. He was out of a 930-gallon cow, while his sire was the grandson of the 2,000-gallon cow Hardwick Ashberry. The winning baby steer, a fourteen-months beast scaling over 9¼ cwt. has milk in abundance up to 1,500 and 1,150 gallons on either side of his pedigree.

How well milk and beef were combined in the breeding of these and other of the Red Poll exhibits, which, with a total entry of thirty, exceeded those of nearly all other breeds, is seen in the fact that they averaged 63 per cent. carcass weight as against live weight. The subsequent reports of the butchers substantiate the great asset of the Red Poll for beef production, owing to the low percentage of waste, which finds ample testimony in such remarks as, "nearly a model carcass; no waste whatever, other cattle bought did not equal the Red Polls for the low percentage of waste."

Respecting two commended heifers exhibited from the Sandringham herd of His Majesty the King the buyers report that the killing percentages were 70 lb. and 69.5 lb. per cwt.

Lead Poisoning of Calves and Pigs.

A case came under notice recently in which a farmer reported the death of three well-grown bacon pigs and some calves. Several months ago, when his house and outbuildings were being painted and renovated, the painters, when finishing up the job, carted away a number of old paint tins and bagging bespattered with paint, and deposited them in a corner of a paddock to which the pigs and calves later had free access. Wet weather followed, and some of the tins filled with water. It was this water that the calves and pigs drank with the result stated. This is not the first case, the Senior Instructor in Pig Raising reports, in which fatalities have occurred from paint pot water poisoning. A similar case occurred several years ago from the drinking of water from tins in which rabbit poison had been stored. The losses emphasise the necessity for immediately burying deeply any containers of this description in order to avoid the risk which inevitably exists if they are left lying about the yards or paddocks.

No Snobbery.

One of the most priceless stories I know is the one told about Charles Lamb. He was rather a timid man, but could be withering at times, and there was nothing that he hated like snobbery. One day he was talking with a snob who did his best to prove that no man could be worth anything or count for anything unless he had received a Public school education—that is, an English Public school, which might be compared with our Great Public Schools here. Lamb listened as patiently and as respectfully as he could.

"And in support of this contention," said the snob heavily, "take Byron, for example. He was a Harrow boy."

"Yes," replied Lamb dryly, "and take Burns. He was a ploughboy."—C.G.C.C., Strathfield, in "The Sydney Morning Herald."

The Cow and the Car—Stock Route Wisdom.

"A man who does not stop his car when a herd of cattle is on the road is a menace and a fool." That was the view expressed by a magistrate at Truro, Nova Scotia, when delivering judgment regarding the circumstances of the decease of a wandering bovine. The magistrate also said that no driver can determine what a cow is going to do, and that the onus is therefore upon the driver.

The "Montreal Gazette," in an editorial, treats the subject with serious humour: "Nothing could be more true than the facts set forth in his Worship's final sentence. Nobody knows what a cow is going to do—not even the cow. The motorist finds himself upon the horns of a dilemma. He wishes to pass the cow but he has no means of knowing where the cow will be when he arrives. He has little stomach for it, whereas the cow has four. The driver has no preconceived antipathy towards the cow; indeed, the milk of kindness may be in him. His ordinary sentiment in the matter of cows is one of goodwill and esteem. He has no desire to injure either hair or hide of the ruminant ruminating in the highway; but the cow, preoccupied with gustatory problems peculiar to its field of activity, has a tendency to gyrate. The cow, in moments of abstraction common to all deliberative mammals, college professors, etc., is subject to unpremeditated and therefore unforseeable vagaries of locomotion. These are distinctly embarrassing to the automobile driver, whose only safe course, particularly in view of this recent judgment, is to go back a few miles and detour. It is difficult, in the light of personal experience, to completely stifle all sense of sympathy for the Truro offender who is thus left to chew upon the cud of his melancholy reflections. But there is a point of great importance involved. A way out has been found for the ordinary human biped, who has no right of way. All that he has to do now is to look like a cow."—From "Things We Talk About," by "Himi," in the current "New Zealand Farmer."

Milking Machines—Importance of Proper Care.

Discussions as to the practical success of milking machines have continued since they were first introduced. Milk and cream from herds milked by the aid of machines have, on occasions, been inferior to that produced by hand milking. Investigations into the cause of the inferiority have frequently shown that the dairyman possessed insufficient knowledge of the proper operation of the machine, or possibly the type of machine used did not lend itself to speedy and convenient dismantling, cleansing, and sterilising. When proper care is taken and the machines are of reputable make (writes a departmental dairy instructor) the milk produced by machine milking should be equally as good as, if not superior to, that produced by hand milking.

A good machine should preferably have the joints coupled with metal unions to prevent the milk line sagging after it has been in use for a few months. The line running from the vacuum tank to the vacuum pump should have joints similar to those in the milk line, in order to allow for simple dismantling and to ensure air-tight joints whenever it is necessary to disconnect and re-erect the plant. Some older types of machines have this line constructed of ordinary galvanised iron piping and sockets. This renders cleansing difficult, due to the uneven interior surfaces, dismantling unsatisfactory, and the development of air leaks unless particular care is taken.

Milking machines must not be regarded as complete milkers, but only as a method of removing the flush milk from the cow. Stripping by hand is usually necessary. A satisfactory method of determining how long the machine should be allowed to remain on a cow is by grasping the milk line running from the claw to the main line. If this is still warm, the flush of the milk has not been removed, but should it show signs of cooling off, then the machine should be removed.

Care should be taken to see that the cups are not left on too long, also to see that too high a vacuum is not maintained, as these practices may injure the udder of the cow. The vacuum on most plants should not exceed 15 inches.

The cleansing of machines is simple, but must be carried out in a regular and thorough manner. Once neglected, it becomes a difficult matter to restore them to their original sanitary condition.—A. and P. Notes, N.S.W. Dept. Agric.

A Heavy-weight Pig.

Mr. R. G. Watson reports having sold recently a very heavy-weight Large White sow pig which on slaughter dressed 465 lb., from which it was estimated that her live weight was approximately 700 lb. It is not often that pigs attain such weights.

The High Cost of Doing Nothing.

Following are extracts from a recent talk broadcast by the Editor from the National Station, 4QG, Brisbane, by courtesy of the Australian Broadcasting Commission:—

In Queensland moisture is predominantly the limiting factor in pastoral production, and consequently the natural water supply affects the economic structure of the State. To anyone with a knowledge of our Western country, how pleasant it was to read recently of widespread rainfall over a large extent of our sheep and cattle lands of, for instance, the Bulloo running a banker at Tambo, and 5 miles wide in places. Except for a few overshot dams here and there on station property what have we done to conserve at least a proportion of that enormous volume of water for seasons in which the monsoonal downpours may not be so generous? There is scope there, surely, for a really national policy. The cost would be tremendous, of course, but the cost of doing nothing, as expressed in the loss of stock in dry times, may be very much greater.

Queensland is remarkably rich in the number and nutritive value of our native grasses, and a strong characteristic of many of them is drought resistance. Nearly 80 per cent. of the State's income is derived from our grasslands. Grass is, therefore, the most important crop in the whole range of the State's production. In our grasslands we have obviously a wonderful asset and a great inheritance. What have we done, or are we doing, to prevent that asset from vanishing, and to preserve that inheritance? Happily a ''grass consciousness'' is growing, presumably because the high cost of doing nothing is now included in our reckoning.

Queensland possesses a delightful climate for most of the year. A winter in our Western country is superb. Our bore waters have all the virtues of much advertised European spas. What have we done to develop a tourist trade for the interior? Every district has some natural feature or some charm of climate and landscape that would attract ''paying guests'' in their hundreds if they knew anything about it. In Canada, the tourist trade ranks with paper and wheat in revenue importance. Have we seriously calculated the high cost of doing nothing in this connection? We mean that, of course, in respect of district or local effort which could well be co-ordinated with the central directive tourist services, the efficiency and value of which are not questioned for a moment.

Queensland has immense areas of fertile country, and every type of soil from the lighter loams to heavy black alluvia and volcanic deposits of extraordinary depth and richness is represented. Is it not time that we calculated the cost of doing nothing—in a national way, of course—to preserve our soils from wind and water erosion? Erosion takes twenty times as much plant food from the soil as the hungriest crop. In the ten years between 1923 and 1933 30,000,000 acres of agricultural land were destroyed by soil erosion and ultimately abandoned in the United States. Within forty years 90 per cent. of cultivable soil has been washed away in parts of British East Africa. This is what a Commission appointed by the Union Parliament reported recently:—There was very little evidence of change of climate, but that since the beginning of European settlement enormous tracts of country had been more or less denuded of the original vegetation, with the result that rivers and waterholes had dried up. The consequent prospect was stated in this alarming way:—''The simple unadorned truth is sufficiently terrifying without the assistance of rhetoric. The logical outcome of it all is the great South African desert, uninhabitable by man.'' The report goes on to say:—''The quantity of rainfall shows little variation; its utility has certainly diminished, for the quantity absorbed by the soil is continuously decreasing, and for this man is responsible.''

The tremendous losses of soil by erosion in every country in historic times is known to every student. China furnishes a particularly sad example. In his book ''Travels and Men,'' published last year, the renowned traveller and author, Mr. J. H. Curle, writing of the Yunnan Province, calls it an ugly barren country, a portion of only too much of China. ''There is hardly anywhere a tree. Hardly anywhere a shrub—and often not even Nature's covering of grass. At daybreak, far up, far up the mountain sides you see coolies tearing the grass out by the roots; in the afternoon staggering under their loads they carry it down to the villages. China has long ago been stripped, wherever there is population, of her timber and low-lying scrub. When the rain comes there is nothing to prevent erosion, and the face of the land, certainly of each mountain and hillside, has become deeply scarred with a thousand water channels, which widen as the years go by.

''It is a ghastly sight. The result of centuries of misgovernment and greed; of the steady diversion of public money from afforestation. . . .'' Against that he quotes Japan. ''Consider,'' he says, ''the face of Japan. It is a mosaic on all its uplands of splendid forests and groves and glades and endless undergrowth. When a great tree is cut down for its timber it is replaced. When a grove of bamboos is taken for its many utilitarian purposes, another is planted. Nothing is let to run down. No area is wasted. And if it be Government property, no money is misapplied. Japan's timber, and all her greenery, are to her a mighty asset; they are perhaps the truest measure of her civilisation—and of China's.''

There is a lesson in that comparison for every Queenslander interested in the wellbeing of our primary industries; in fact, every Queenslander who is interested in the whole future of this country.

The causes of erosion are various, but the primary and most important cause is the widespread destruction of forests and other soil-binding and soil-retaining vegetation. Every farmer on our coastal river catchment areas, as well as every producer in our back country, can see in his own neighbourhood what damage to both agricultural and grazing country unchecked soil erosion can do—damage quite unnoticed until, in many cases, the land has been robbed of its natural fertility by sheet erosion, or become so broken as to be useless not only for cultivation but for grazing also. It is no exaggeration to say that in Australia almost every acre of sloping farm land, and much that is out of cultivation, in the higher rainfall zones is being affected by soil erosion. Only in recent years has any notice been taken of it, and only then by those to whom the plain facts have become apparent. Through the action of wind and water, depreciation and destruction of land have become definitely a serious national problem demanding immediate and adequate attention.

In regard to such a problem, China provides a classic example of the high cost of doing nothing—a cost that is paid annually in famine, death, and economic servitude.

Coming back home, it is only fair to say that in Queensland—or should we say Australia—neglect and improvidence, although considerable, are not the most important factors in creating the menace of erosion of farm lands. The hand of man is more evident in the destruction of forests, the natural consequence of which is water erosion and increasing severity of floods. The worst floods ever known in Victoria occurred last year. There a part of the continent, once covered by dense forests, and with a comparatively heavy rainfall, has been stripped of its natural protection. Forests are natural reservoirs, retarding the flow of rain water from the hills, and facilitating evaporation. There it has been found that as timber reserves and catchment areas the hill country is a valuable asset; denuded of trees and shrubs it becomes a dangerous liability and a menace to productive farmlands miles away. Fortunately, it may be said in this regard that the high cost of doing nothing has been recognised by Commonwealth and State Governments who are alive to the urgency of the problem.

That leads us to a concluding suggestion that in all these questions of definite national importance, while we are calculating the high cost of doing an essential job, we might well consider just as keenly the high cost—possibly the ruinously high cost of doing nothing.

The Agricultural Show.

Since the dawn of civilisation, the agricultural fair has been regarded as a great social asset, a factor quite apart from the facilities for trade and barter and the enlarged educational outlook consequent on new things seen and heard. In the early ages, religious festivals offered outlets for trade, and in the Code of Kham-murabi, the Babylonian Emperor, B.C. 2250, the law is laid down for proper conduct of trade, based on the experience of the previous 1,000 years since the reign of Sargon of Sumeria in B.C. 3800. In China, the Emperor Fu-hi in B.C. 2852 issued orders regarding agricultural fairs which were comprehensively dealt with by his successor, the great agriculturist, Shunnung. The festival at Delos and the Olympic games in ancient Greece were merely the opening days of gigantic fairs, and in ancient Italy the vast annual assembly at Voltumna merged itself into a famous mass meeting for social intercourse and trade. India with its great annual fair at Hurdwar on the upper Ganges, Russia with Nijni Novgorod, Germany with Leipsic and Frankfort, England with Stowe, Barnet, and Nottingham, all in turn have passed the torch westward to Canada, where at Toronto, the Canadian National Exhibition or fair, for that is what it really is, and the Royal Winter Fair stand at the present day in the direct line as among the greatest annual agricultural fairs. Modern invention may claim to have displaced many methods of an older generation, but the radio, the telegraph, the motor car, and every other modern invention seem merely to have conspired to solidify the wisdom of the ancients in providing the thrill of an ever-widening social circle and the opportunity for a generous education through personal experience in the agricultural fairs of to-day.—''The Journal of Agriculture,'' Quebec (Canada).

DURABLE WHITEWASHES.

The following formulæ for making whitewash have been taken from U.S.D.A. Farmers' Bulletin 1452, *based* on *formulæ in National Lime Association Bulletin* 304-*B*:—

Whitewash No. 1 (for sheds, &c.).—Carefully slake half a bushel (38 lb.) of good quicklime; strain the paste, while still thick, through wire fly screen, and add it to a solution made by dissolving 15 lb. of common salt in 7½ gallons of water, mixing thoroughly. Thin with more water.

Whitewash No. 2 (for sheds, &c.).—Carefully slake half a bushel (38 lb.) of good quicklime; strain the paste, while still thick, through wire fly screen, and add about 4 gallons of hot water. While stirring vigorously pour into the lime mixture a solution made by first dissolving 12 lb. of salt and 6 oz. of alum in about 4 gallons of hot water and then adding 1 quart of molasses. Thin with water.

Whitewash No. 3 (for high-grade work).—(*a*) Carefully slake half a bushel (38 lb.) of good quicklime; strain the paste, while still thick, through wire fly screen, add about 4 gallons of water, allow to cool. (*b*) Dissolve 3 lb. of borax (better, trisodium phosphate) in about 3 gallons of skimmed milk (better, in 1 gallon of water, which is afterwards added to 5 lb. of casein previously softened for two hours in 2 gallons of hot water). (*c*) Dissolve 3 pints of formaldehyde in about 3 gallons of water.

When the paste (*a*) and the milk (or casein solution) (*b*) are thoroughly cool, slowly add the milk (or casein solution) (*b*) to the lime (*a*) stirring constantly. Just before using slowly add the formaldehyde solution (*c*) to the batch, stirring constantly and vigorously. Adding the formaldehyde too rapidly may cause the casein to jell, thus spoiling the mixture.

Caution.—If all of this mixture cannot be used in one day, use only a half or third, or other fractional part of each of the three parts (*a*), (*b*), and (*c*), and mix the rest as desired, since a fresh solution each day gives better results.

In all of these directions, one sack (50 lb. of hydrated lime, which has been well protected from the air, can be used in the place of freshly slaked lime. In No. 1 the hydrated lime can be added directly to the salt solution; in Nos. 2 and 3 it should first be made into a paste by mixing it thoroughly with about 7 gallons of water.

Whitewash No. 4 (disinfectant whitewash).—For a mild disinfectant or insecticidal whitewash, add a quart of crude carbolic acid to the whitewash obtained by slaking half a bushel (38 lb.) of quicklime, or by mixing a sack (50 lb.) of good hydrated lime with water.

For strong germicidal whitewash, add 2 quarts of crude carbolic acid to the whitewash.

Whitewash No. 5 (disinfectant whitewash, small quantity).—Dilute 1½ quarts of commercial lime-sulphur with about 3 gallons of water and add 3 teaspoonfuls of common salt, previously dissolved in a pint of water. To this solution add, while stirring constantly, a lime cream made by mixing a heaping quart of good hydrated lime with water (or by slaking about 2½ lb. of fresh quicklime and straining through wire fly screen).

GENERAL SUGGESTIONS.

In using quick or burnt limestone care must be exercised in adding the water if good results are to be attained. Add the water a little at a time to the lime in a clean wooden pail, keg, or barrel. When slaking is well started add more water gradually to replace that lost in the slaking process. If not enough water is added the lime will become "sorched," and part of it will be granular. On the other hand, if too much water is added at one time it may retard or "quench" the slaking process. After the lime is completely slaked add enough water to make a thick paste, cover the container, and allow to stand for several hours or overnight.

PLATE 161.

SECTION OF A FOREST SERVICE NURSERY (SHOWING KAURI PINE SEEDLINGS IN FOREGROUND).

have been established in Queensland, in which, at 30th June, 1935, 4,000,000

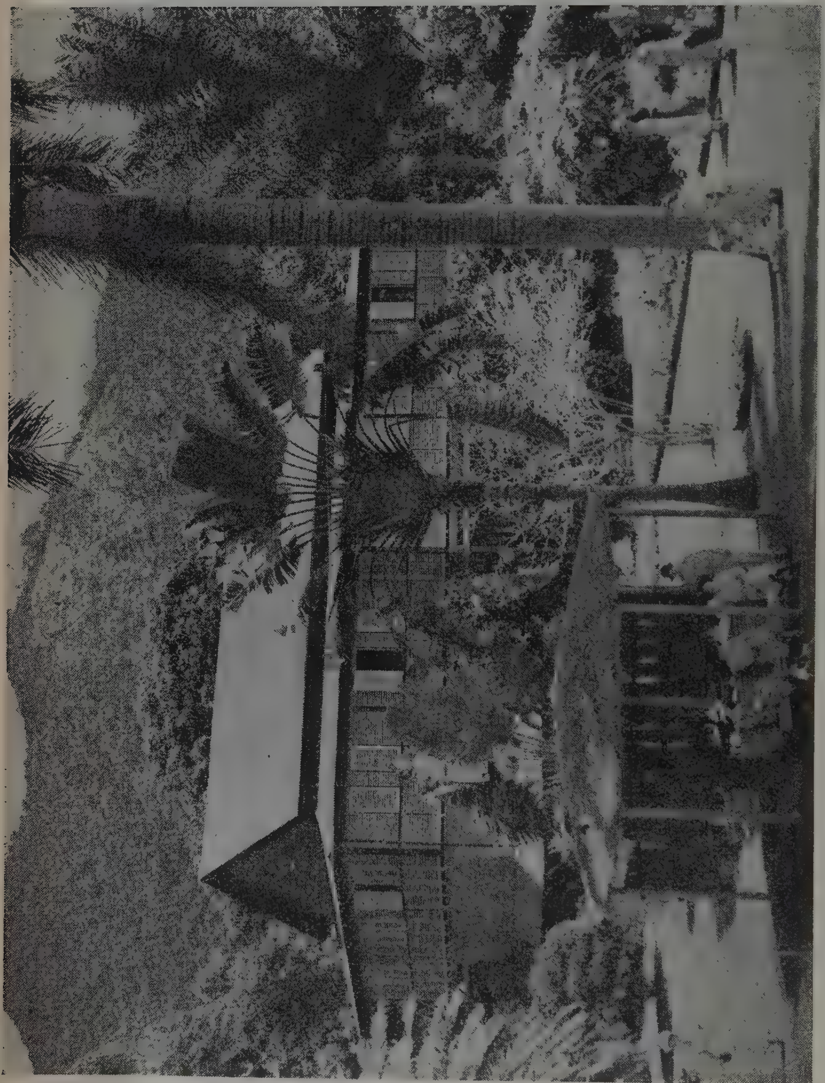


PLATE 162.—MORNING IN A GARDEN NEAR CAIRNS.

North Queensland is noted for home gardens of infinite charm and gorgeous colouring of tropical shrubs and flowers.

[*Photo. by courtesy of "The Telegraph," Brisbane.*

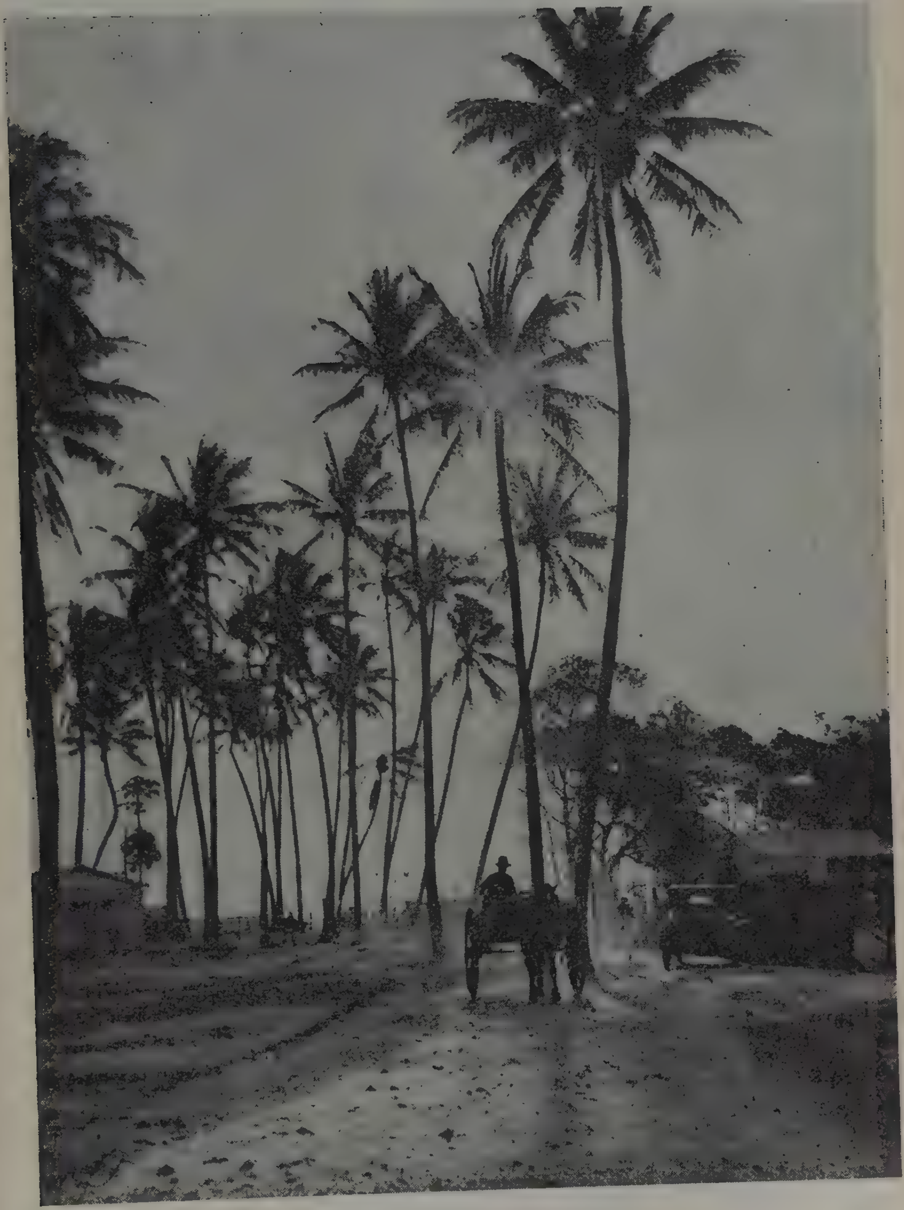
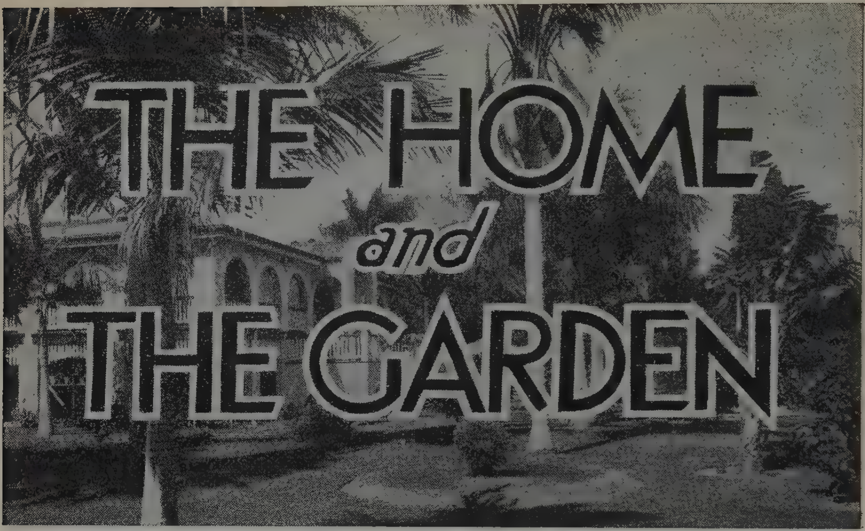


Plate 163.

Near the End of the Day.

A coconut palm grove on a sugar cane plantation near Mackay.

[*Photo. by courtesy of "The Telegraph," Brisbane.*



OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

SLEEP AND REST.

EVERYONE knows that bad feeding ruins many babies, but few people realise the damage done by not ensuring a full and regular allowance of uninterrupted sleep and rest every day throughout infancy and early childhood. During sleep Nature repairs the worn-out parts and attends to the growth of the whole organism; hence it is that when rapid growth is taking place Nature demands a maximum amount of sleep.

How Much Sleep is Needed?

In the first month of life a baby should sleep nine-tenths of his time.

At first all the time not needed for feeding, bathing, &c., is devoted to sleep; but after the first month or so a baby wants more and more waking hours for crowing and kicking, and, indeed, for practising and enjoying the use of all the growing senses, faculties, and powers of body and mind. At six months of age a healthy baby can enjoy himself for six or eight hours a day. By the time he is a year old (allowing a night of twelve hours' sound sleep) a baby should still have as much as three hours of day sleep—say, two hours in the morning and one in the afternoon, given at the same time every day.

Baby's Rights with Regard to Sleep.

How many modern babies are sure of their rights in these most important matters—the "night sleep" and the "day sleep"? Many town babies accompany their mothers to the pictures from the time they are a year old, and there are few infants whose periods for day sleep are kept sacred and inviolate. Of course, one fully recognises that the modern mother is beset with difficulties arising out of the fact of her not being able in most cases to get any helper or understudy to look after the home while she takes necessary outings, does her shopping, &c. However, the first thing is to recognise what the baby ought to have—and indeed must have—if the most perfect development of manhood or womanhood is to be attained, proper growth of body, mind, and character, all inseparably bound up and dependent on one another.

One notices, too, that even where there is no excuse of over-work or lack of help for the mother babies are often no better off, simply because people have no idea that it does a small child any serious harm to be trapsed about all over the country on Sundays or holidays, or, indeed, on any occasion where the parents may have the opportunity of getting off the chain themselves. Again, one sees weary, fretful, or precociously lively babies, or small urchins kept up every evening for an hour or so "because father likes having them about after he comes home."

Insufficiency of Sleep and Over-stimulation.

Our main purpose to-day is to draw attention to the fact that stunting of growth and development, nervousness, and all-round instability and precocity may result from robbing a child of its proper sleep, and from stimulating it when it ought to be at rest and growing.

Any kind of over-stimulation or over-exertion is injurious to children. One frequently sees small children made nervous, high-strung, irritable, and capricious by being habitually dragged about in the evening long after bedtime to the point of weariness and fatigue—this being done by parents devoted to their offspring, but without any idea as to what a child needs in the way of regularity, early hours, and unbroken sleep and rest.

IN THE FARM KITCHEN.

MAKE MORE USE OF TREACLE.

Some of the ways in which treacle can be used in cooking are:—

1. Add a tablespoon to a rich fruit cake mixture to darken it. One tablespoon is enough for ¾-lb. flour.

2. Use for darkening a plum pudding in the same proportion as given in No. 1.

3. Mix with equal quantity of castor sugar and rub into the scored fat of a boiled ham. Prick with cloves and bake ham till crisp.

Forfar Crisps.

Take 3 oz. treacle, 2 oz. castor sugar, 3 teaspoons baking powder, ¼ gill milk, ¼ lb. rolled oats, ½ teaspoon salt, 1½ tablespoons melted butter.

Grease a baking sheet or tin. Put rolled oats through a mincer into a basin. Mix with baking powder, salt, and sugar. Stir in butter, milk, and treacle. Mix well. Flour the pastry board with 2 tablespoons of rolled oats. Turn dough on to board. Roll out and cut into narrow strips, 3 to 4 inches by 1½ inches. Place on baking sheet or in baking tins. Bake for twenty minutes in a moderate oven, then turn out and cool on a cake rack.

Treacle Toffee.

Take 1 lb. treacle, 4 oz. fresh butter, 6 oz. sugar, 2 oz. almonds.

Put the treacle, sugar, and butter in a saucepan. Place over heat. Bring to the boil. Boil for about twenty minutes, stirring constantly. Remove from heat. Add minced almonds, or any other nuts preferred. Pour into a greased tin. Leave till set, then break roughly.

Ginger Wafers.

Take 2 oz. treacle, 1 oz. butter, ½ teaspoon ground ginger, 1 oz. flour, ½ teaspoon allspice, 1 oz. sugar.

Grease a baking sheet or tin. Heat butter, treacle, and sugar till butter is melted. Turn into a basin. Stir in flour sifted with the spices. Place teaspoonfuls of the batter on baking sheets or tins, in rounds, leaving them plenty of room to spread. Bake till brown. Cool a little. Remove with a palette knife. Roll loosely round a buttered handle. The top of wafers should be on the outside. When set, cool and fill with whipped sweetened cream.

Treacle Spiced Pudding.

Take 1 tablespoon treacle, 4 oz. breadcrumbs, 1 egg, ½ oz. candied orange peel, 1 tablespoon castor sugar, 3 oz. cleaned currants, 1 pint milk, pinch salt, ½ teaspoon ground cinnamon.

Butter a pie-dish. Measure the crumbs into a basin. Heat milk to boiling point in a saucepan and pour over breadcrumbs. Stir in all the other ingredients, mincing the peel and adding the treacle last of all. Stir well. Bake in a moderate oven for forty-five minutes. Enough for four persons.

Treacle Parkin.

Take 1¾ lb. treacle, 1¾ lb. flour, 1 lb. butter, ½ oz. ground mace, ½ oz. grated nutmeg, 1 lb. medium oatmeal, 1 lb. moist sugar, 1 oz. ground ginger, 3 oz. candied peel, ½ teaspoon bicarbonate of soda.

Sift the flour into a basin. Rub in butter with tips of fingers. Mix in oatmeal, sugar, spices, and soda. Heat the treacle until it will run easily, then stir into other ingredients, mixing all well together. Divide mixture between two buttered baking tins. Bake in a moderate oven for 1¼ hours. Leave parkin in tin until almost cold, then turn out and cut into squares.

Treacle Duff.

Take 2 tablespoons treacle, ¼ lb. flour, ¼ lb. cleaned currants, pinch salt, ¼ lb. breadcrumbs, ¼ lb. shredded suet, ¼ lb. raisins, 1¾ gills milk, 1 teaspoon baking powder.

Mix the flour, sifted with baking powder and salt, with suet and breadcrumbs. Add prepared fruit. Stir in treacle and enough milk to make a stiff batter. Beat batter well, then pour into a greased basin. Cover with buttered paper and steam for about 2½ hours.

STANTHORPE APPLES FOR DESSERT.

Granny's Nightcaps.

Take 6 or 8 apples, 1 teaspoonful apricot jam for each apple, 1 tablespoonful brown sugar for each apple, pastry as required.

Roll out the pastry and cut it into as many squares as there are apples. Peel and core the apples without breaking them. Spread each square of pastry with apricot jam. Stand the apple on it. Fill the hole in the apple with sugar. Close up the pastry round the fruit. Press the edges well. Bake the apples on a greased tin in a brisk oven till the pastry is nicely browned. This will take about twenty-five minutes, according to the size of the apple.

Apple Glace.

Take two large, firm, red apples, cold water, sugar, angelica, cream to serve.

Wash apples and core them. Beginning at the stalk end, peel them about a third of the way down and place in a saucepan. Make a thin syrup with a third of a cup of sugar and half a cup of water boiled together for about six minutes. Pour over the apples, cover the pan closely, and cook very slowly over a small gas-burner until tender, basting occasionally. Remove cover, place 1 teaspoonful castor sugar in the hollowed out part of each apple, and put beneath a grill or in a hot oven until sugar is melted. This should coat the apples and give them a transparent, shiny look. Decorate with leaves of angelica, and serve with cream or custard.

Apple Shape.

Take 1 lb. apples, 1 lemon, 3 oz. sugar, ¾ oz. gelatine, water.

Peel and core apples. Cut into small pieces and put into a saucepan. Add sugar, half a pint of water, and the grated rind and strained juice of the lemon. Cook until tender. Dissolve gelatine in half a gill of hot water. Rub apples through a sieve, then stir in dissolved gelatine. Pour into mould rinsed out with cold water, and leave to set. Serve if liked with custard. A very pretty effect can be obtained by colouring half the apple puree with a little cochineal.

Apple and Quince Mousse.

Take 5 oz. peeled apples, 1 quince, 2½ oz. sugar, ½ pint lemon jelly, 1 egg-white, strip lemon rind.

Dissolve jelly crystals in boiling water, making half a pint of liquid in all, and leave to cool. Cover the bottom of a saucepan with a little water, put in the peeled and cored apples, quince, lemon rind, and sugar, and simmer until quite soft, then put through a sieve. When the jelly is beginning to set, beat it up together with the apple puree, mixing thoroughly. Beat the egg-white to a stiff froth and fold in the mixture. Pour into a mould and leave to set. Serve as cold as possible.

Grated Apple Pudding (Iced).

Take 1 lb. sweet apples, 1 lemon, castor sugar to taste, ¼ pint cream, a few drops cochineal.

Take the apples, peel and quarter them, and grate them on a coarse grater. Take the lemon and grate part of the rind, adding a few drops of the juice. Unless this pudding is served at once it is apt to turn brown; therefore, it is wise to add a few drops of cochineal. Place the mixture in custard cups or any other glass cups, ice thoroughly, and serve with slightly sweetened, whipped cream on the top of each cup. Garnish with chopped nuts.

Apple Jam.

Take 4 lb. apples (peeled and cored), rind and juice 1 lemon, 1½ oz. lump ginger, few cloves, 1 pint water, allow ¾ lb. sugar to every pint of pulp.

Wipe the apples, peel them very thinly, cut into quarters, and take out the core. Cut the lemon rind thinly and tie in a piece of muslin with a few cloves and the bruised ginger. Put the apples into a preserving pan with the water and flavourings and cook gently till soft. Take out the muslin and rub the apples through a sieve. Measure the pulp and allow the sugar in proportion. Return to the pan with the flavouring bag. Add the lemon juice and sugar, cook slowly till the sugar is dissolved, then boil until it will jelly when cold. Take out the flavouring bag before potting the jam.

Apple and Onion Ketchup.

Take 12 tart apples, 2 minced onions, 1 level teaspoonful mustard, 1 level teaspoonful ground cloves, 2 level teaspoonfuls ground cinnamon, 1 small level tablespoonful salt, 1 pint pure malt vinegar, 6 oz. castor sugar.

Pare, quarter, and core the apples. Place them in a saucepan with water to cover. Simmer them till soft, when all the water should be evaporated. Rub the apple pulp through a sieve. Add to each quart the other ingredients given. Should the apples not be large enough to yield a quart, it is better to cook a few more than to alter the quantities of the other ingredients. Simmer the ketchup for one hour and bottle.

Apple Chutney.

Take 6 lb. apples (after being peeled and cored), 2½ pints vinegar, ¾ lb. onions, 1 lb. raisins, 1 lb, brown sugar, 3 tablespoonfuls salt, 2 teaspoonfuls ground ginger, 6 chillies.

Peel and core the apples and weigh them. Chop them up or grate finely. Wash, dry, and stone the raisins. Crop them. Peel and grate the onions. Put all the prepared ingredients into a pan, add the sugar, vinegar, chillies, ginger, and salt. Stir them all together. Bring to the boil and boil the chutney gently for about twenty minutes. Choose sour apples for this chutney.

A Tasty Ham Dish.

Ham and eggs are always popular for breakfast, but to vary the menu in serving them plain make these delicious little ham cakes, and when serving place a fried egg on the top of each garnished with a sprig of parsley:—

Mince ¼ lb. of cooked ham with a small onion. Mix with ½ lb. cold boiled potatoes and mash well together. Then add a little chopped parsley and salt and pepper to taste, also a little tomato sauce if liked. Divide into three portions and make each into a flat, round cake. Fry carefully in a little hot fat, and then place the egg on the top and serve hot with crisp toast and a nice cup of tea or coffee or cocoa.

Orchard Notes

MAY.

THE COASTAL DISTRICTS.

IN these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally as important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ inches in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of blue-mould infected or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one-sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month, and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

CLEAN up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place, as, if delayed till the pruning has been finished, the land is apt to dry out.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweeetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manures—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland, and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

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Farm Notes

MAY.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late-maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland. Prairie grass seed should be treated with formalin or a reliable mercury dust before sowing.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

* * *

A HOME-MADE VYCE.

This vyce will hold a piece of wood as tightly as an iron vyce will. One would need a piece of 8 inches by 1½ inch as high as the table, and another piece of 5 inches by ⅞ inch two-thirds the height of the table. A block 4 inches by 1 inch by 4 inches is nailed on to the big piece half the way up, and a hinge is put on to this and the smallest piece of board. The big piece is then let in at the top, as in the diagram, and is nailed on to A. A hole is then bored through all these, and a bolt is put through with a washer on both ends. A spring is put between the two boards with a nut on the end. With a spanner it is an easy matter to tighten the nut. This bolt needs a thread from the outside of the moving jaws when shut to the end.

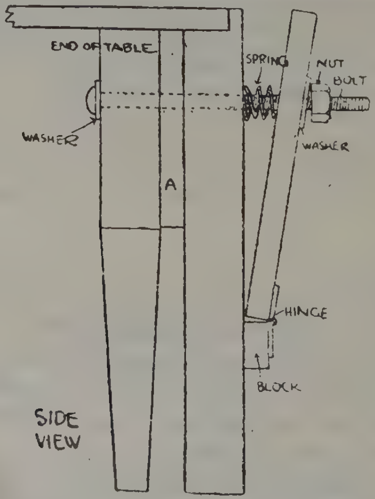

PLATE 164.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1936 AND 1935, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Feb.	No. of Years' Records.	Feb., 1936.	Feb., 1935.
North Coast.	In.		In.	In.
Atherton	10·52	35	15·18	7·63
Cairns	15·70	54	29·57	14·94
Cardwell	16·63	64	51·31	10·72
Cooktown	13·65	60	22·61	6·49
Herberton	7·90	50	10·43	4·64
Ingham	15·85	44	41·74	7·95
Innisfail	22·36	55	53·89	16·21
Mossman Mill ..	17·91	23	29·15	11·48
Townsville	10·99	65	28·70	0·60
Central Coast.				
Ayr	8·81	49	28·61	2·51
Bowen	8·66	65	16·67	4·98
Charters Towers ..	4·40	54	7·66	2·15
Mackay	11·47	65	27·99	16·59
Proserpine	12·16	33	29·98	17·41
St. Lawrence ..	7·78	65	5·30	3·19
South Coast.				
Biggenden	4·48	37	1·59	3·09
Bundaberg	6·64	53	1·27	6·32
Brisbane	6·28	85	1·27	5·59
Caboolture	7·92	49	1·61	7·28
Childers	6·86	41	1·92	4·22
Crohamhurst.. ..	13·14	43	2·09	16·03
Esk	5·55	49	2·05	3·91
Gayndah	4·29	65	0·87	5·15
Gympie	6·87	66	2·00	8·35
Kilkivan	4·99	57	1·67	3·04
Maryborough ..	6·88	65	2·46	7·04
Nambour	9·90	40	3·30	15·64
Nanango	4·13	54	1·64	3·49
Rockhampton ..	7·75	65	4·69	3·79
Woodford	8·61	49	0·85	9·28

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Feb.	No. of Years' Records.	Feb., 1936.	Feb., 1935.
Central Highlands.	In.		In.	In.
Clermont	4·22	65	2·42	1·08
Gindie	2·76	37	..	0·77
Springsure	3·87	67	0·93	1·09
Darling Downs.				
Dalby	2·86	66	0·61	1·47
Emu Vale	2·59	40	0·28	3·86
Hermitage	2·48	30	..	1·25
Jimbour	2·67	48	0·45	2·49
Miles	2·71	51	1·64	0·36
Stanthorpe	3·20	63	0·48	3·15
Toowoomba ..	4.58	64	1·47	3·67
Warwick	3·08	71	0·91	2·84
Maranoa.				
Roma	2·91	62	1·72	0·97
State Farms, &c.				
Bungeworgorai ..	2·15	22	..	0·75
Gatton College ..	3·60	37	2·03	5·98
Kairi	9·89	22	..	7·79
Mackay Sugar Experiment Station	10·49	39	27·21	15·44

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—FEBRUARY, 1936.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Means at 9 a.m.	SHADE TEMPERATURE.						RAINFALL.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·74	88	72	99	2	69	23, 24	2,261	19
Herberton	..	81	67	89	1, 2	57	25	1,043	15
Rockhampton	29·89	87	72	96	24	66	3	469	10
Brisbane	29·97	84	68	92	22	63	1, 20, 27	127	15
Darling Downs.									
Dalby	29·83	90	64	103	23	57	1	61	6
Stanthorpe	..	83	59	96	23	50	1	185	3
Toowoomba	..	82	60	97	23	56	1	147	10
Mid-Interior.									
Georgetown	29·77	93	75	102	3	73	1, 20, 23	500	17
Longreach	29·81	97	75	105	8	71	19	57	6
Mitchell	29·90	91	68	101	22, 23	63	3	285	6
Western									
Burketown	29·73	92	78	107	3	73	1, 22	459	12
Boulia	29·77	99	76	108	8	68	12	249	6
Thargomindah	29·83	95	75	104	5, 9	67	12, 13	136	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April, 1936.		May, 1936.		MOONRISE. April, 1936.	MOONRISE. May, 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·2	5·50	6·18	5·20	2·29	2·4
2	6·3	5·49	6·18	5·19	3·2	2·34
3	6·3	5·48	6·19	5·18	3·33	3·5
4	6·4	5·46	6·20	5·17	4·3	3·35
5	6·4	5·45	6·20	5·17	4·38	4·9
6	6·5	5·44	6·21	5·16	5·3	4·47
7	6·5	5·43	6·21	5·15	5·35	5·25
8	6·6	5·42	6·22	5·14	6·10	6·13
9	6·6	5·41	6·23	5·14	6·45	7·4
10	6·7	5·40	6·23	5·13	7·27	7·58
11	6·7	5·39	6·24	5·12	8·14	8·57
12	6·8	5·38	6·24	5·11	9·7	9·57
13	6·8	5·37	6·25	5·11	10·2	10·59
14	6·9	5·36	6·26	5·10	11·1	12·0
15	6·9	5·35	6·26	5·10		..
					a.m.	a.m.
16	6·10	5·34	6·27	5·9	12·5	1·2
17	6·10	5·34	6·27	5·9	1·7	2·6
18	6·11	5·33	6·28	5·8	2·11	3·12
19	6·11	5·32	6·29	5·8	3·16	4·19
20	6·12	5·31	6·29	5·7	4·23	5·28
21	6·12	5·30	6·30	5·7	5·30	6·37
22	6·13	5·29	6·31	5·6	6·42	7·42
23	6·13	5·28	6·31	5·6	7·53	8·44
24	6·14	5·26	6·32	5·5	9·0	9·37
25	6·14	5·25	6·32	5·5	10·2	10·20
26	6·15	5·24	6·33	5·4	10·58	10·59
27	6·15	5·24	6·34	5·4	11·48	11·35
					p.m.	p.m.
28	6·16	5·23	6·34	5·3	12·28	12·5
29	6·16	5·22	6·35	5·3	1·2	12·35
30	6·17	5·21	6·35	5·2	1·35	1·5
31			6·36	5·2		1·35

Phases of the Moon, Occultations, &c.

7 April,	○	Full Moon	8 46 a.m.
15 ,,	☽	Last Quarter	7 21 a.m.
24 ,,	●	New Moon	10 32 p.m.
28 ,,	☾	First Quarter	9 16 p.m.

Apogee, 6th April, at 3.36 p.m.
Perigee, 21st April, at 6.12 a.m.

On the 10th Mercury will be in the part of its orbit beyond the Sun and, technically, in superior conjunction with it; but Earth, Sun, and Mercury will not be exactly on the same straight line. The distance of Mercury from the Earth varies considerably. On this occasion it will be more than 128 millions of miles distant.

Jupiter, after moving slowly eastward amongst the stars of Orphincus, will apparently come to a standstill on the 10th of April and instead of getting into Sagittarius will appear to be moving slowly westward and continue amongst the stars of Orphincus until at the end of October it will reach Sagittarius.

On the 17th Mercury, still on the far side of its orbit, will be technically in conjunction with Uranus though the actual distance between the small and the large planet will amount to more than 1,700 million miles.

On the 19th at 7 a.m. Saturn will be 7 degrees south of the Moon, 4 hours after rising, but as the Sun will rise about an hour earlier a popular spectacle will be obviated.

A day later Saturn will be replaced by Venus at 8 p.m., four hours after setting.

On the 23rd at 2 a.m. Mercury and Mars will be about a degree apart when far below the horizon.

On the 25th the Sun will pass between Uranus and the Earth, the bigger planet then being more than 1,780 million miles beyond the Sun.

Mercury sets at 5.29 p.m. 21 minutes before the Sun on the 1st, and at 5.51 p.m., 16 minutes after it on the 15th.

Venus rises at 4.15 a.m., 1 hour 47 minutes before the Sun on the 1st; on the 15th it sets at 5.42 p.m., 7 minutes after the Sun.

Mars rises at 7.24 a.m., 1 hour 22 minutes after the Sun, and sets at 6.44 p.m., 54 minutes after it, on the 1st; on the 15th it rises at 7.17 a.m., 1 hour 8 minutes after the Sun, and sets at 6.21 p.m., 46 minutes after it.

Jupiter rises at 9.56 p.m. and sets at 11.44 a.m. on the 1st; on the 15th it rises at 9.5 p.m. and sets at 10.48 a.m.

Saturn rises at 4.8 a.m. and sets at 4.46 p.m. on the 1st; on the 15th it rises at 3.20 a.m. and sets at 3.56 p.m.

6 May,	○	Full Moon	1 1 a.m.
14 ,,	☽	Last Quarter	4 12 p.m.
21 ,,	●	New Moon	6 34 a.m.
28 ,,	☾	First Quarter	12 46 p.m.

Apogee, 3rd May, at 10.24 p.m.
Perigee, 19th May, at 12.36 p.m.
Apogee, 31st May, at 12.54 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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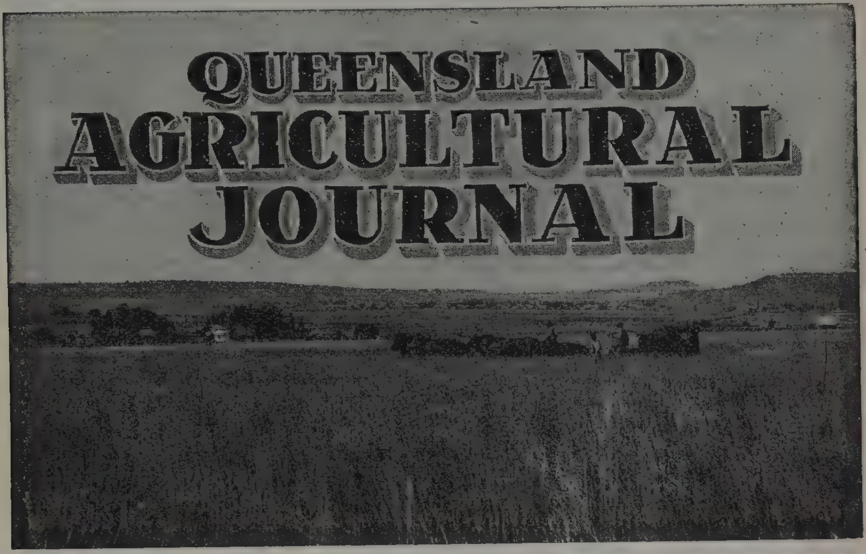

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

Anzac.

THE commemorating observance of outstanding events of the past, the keeping of memorial days, the recurring testimony of reverence and affection displayed on certain anniversaries—these occasions should be something more than mere opportunities for outpourings of sentimentalism.

Their real significance should be realised in the lessons they bring to us, whether of emulation or of hope, or as examples of high purpose and noble endeavour.

Anzac is synonymous with supreme examples of self-confidence and self-reliance; of an independence of obstacles on a great scale of human action and purpose which was sublime in the depth of its courage and majestic in its disregard of the fear of failure.

The Gallipoli landing was the prologue of a four-year epic of continuous heroism, which expressed itself in countless thousands of incidents of courage and fortitude on the part of those without whose unselfish constancy no battle could have been fought at all, whether of victory or defeat.

That record stands unsurpassed in the history of the world. It still challenges the admiration of all men who respect the qualities which make any people really great, and without which no people can be really free.

The things in men that make great achievements possible is much the same in all ages and for all occasions. Chief among these are vision, courage, self-reliance, the spirit of service.

Something more than wind and sail brought Cook and his crew over trackless seas from the Old World to Australia. Something more than mere ability to fly carried Kingsford Smith and Ulm, Parer and McIntosh, Hinkler, Ross Smith and his brother, and so many others over vast continents from Europe to Australia, from America to Australia and back again.

The qualities they and the Men of Anzac displayed are the birthright of our people, bequeathed to us by the discoverers and pioneers of a pathless continent.

The coined word Anzac is synonymous also with service in its highest expression. It is service—service in all departments of life—that Australia needs to-day. For the right to give that service, men of the A.I.F. were ready to die. They did die.

Animals and Plants will catch Disease.

THE man on the land is confronted with all sorts of risks, in addition to the ordinary hazards of his calling. He builds up a herd or a flock in the course of years of thought and effort. He studies breeding, feeding, and weeding—that is, culling out the cows and other animals that don't pay. He studies his soils and plans a sound cropping programme. He does all this with the interest, keenness, zest, and well-directed energy of a man devoted to his job. Then, suddenly, he realises that some disease is taking toll of his herd. A farmer working along approved agricultural lines prepares his land, plants and cultivates the resultant crop. A good harvest is in prospect, and his problems diminish to the one of market prices. The crop upon which his hopes are built begins to wilt, and he wakes up to the fact that disease is robbing him insidiously of hard-earned returns. A market gardener applying all the arts of skilful husbandry, coupled with a shrewd study of domestic demand, aims to hit the market with a cash crop, only to see both crop and hope blighted in a night. All that is included among the risks of the game. Animals and plants *will* catch disease.

More is now known about diseases and their causes. The discovery of microbic life marked a tremendous advance in agricultural and veterinary sciences.

For the stockowner, the danger of transmissible disease is never far away. He may have the idea that his country is clean and he has taken every care to keep up the health of his herd; but bacterial or parasitical infection may be present in the soil or in his animals to manifest itself when conditions favour its virulence. On the other hand, his herd and property may be actually free from contamination, yet by means and in ways undreamt of disease makes its appearance. There are germ ''carriers'' among stock, as among mankind. It is by such ''carriers,'' bought by the farmer in all good faith, that such diseases as pleuro-pneumonia, mammitis, contagious abortion, tuberculosis, and necrotic enteritis of pigs are brought from outside the boundary fence. ''Carriers'' may bring in animal parasites as well.

Microbes causing some diseases often exist in the soil ready to enter the body of a susceptible animal. A paddock may be contaminated by the discharges of sick stock, and it is in this way that tuberculosis, contagious abortion, and scours in calves may be transmitted from animal to animal. The soil of pig and fowl runs and calf pens may become heavily charged with microbic infection, to be taken in with food or gain entrance to animals through scratches or wounds.

It is now well known that animal parasites spend part of their lives in or on the soil, and many common parasitic diseases are contracted from contaminated pastures. Parasites of the skin may be passed on from one animal to another in crowded yards.

Then there are the air-borne diseases. The water supply may be another source of microbic infection. Insect-borne diseases is another problem of the man on the land. Then we have the non-transmissible diseases of stock, poisoning among them caused by poisonous compounds or poisonous plants. Poisonous plants and fodder crops that are poisonous at certain stages of growth are common causes of stock sickness, of a lingering illness, or of a quick death. Diet deficiency is another cause of serious animal ailments. Dietary trouble is often induced by mineral deficiencies in the soil—shortage of lime, phosphorus, salt, iron, or iodine. Tumourous or cancerous growths constitute another type of disease with which the stockowner has to contend. Much stock sickness is due, too, to fungus diseases, like ergot of paspalum. Stock diseases may, therefore, have their origin inside or outside of the animal, and by far the most important are those that attack externally, for they include all the transmissible disorders by which a whole herd or flock may be attacked.

The tendency to-day in respect of domesticated animals and plants, and in respect of man too, is, however, to give more and more attention to health and to stress less and less disease. Nutrition—animal and plant as well as human—is now receiving deeper study, and physiology is destined to displace in status both pathology and bacteriology. The animal and plant, as well as man, equipped with stamina must be, to a large extent, our safeguard against disease. Animal and plant breeders are planning their work accordingly.

What has been said of animals applies to plants also, at least to a wide extent. Diseases of plants arise largely from land impoverishment. In fact, the basis of plant disease, speaking generally, may be found in worked-out soils. The man on the land realises that safety lies in constant care and caution. His fight against diseases and pests—whether by prevention, control, or eradication—is a never-ending job. He knows that animals and plants will catch disease—a fact that, alas, so often takes the smile off the face of the Income Tax Commissioner.

The farmer is realising, too, that prevention is better and cheaper than cure, although a substantial proportion of men on the land still cling to old habits and traditions, resenting the application of scientific discoveries to the improvement and security of both stock and crops. Old-fashioned beliefs die hard, and it remains for the unbelieving to be convinced that science, although a hard taskmaster, is a sound and enduring friend.

Fortunately for us, agriculture and science to-day are working in double harness. The establishment of a School of Veterinary Science, in addition to the Faculty of Agriculture, within the University of Queensland, is of great importance and should prove of immense value to the stockowner. It is regarded as marking the opening of a new era for animal husbandry in this State. In no industry is there a greater opportunity for co-operation than in our primary industry—the co-operation of the scientist with the man on the land. Our Universities, our Departments of Agriculture and Stock, our Council for Scientific and Industrial Research, and other research institutions, are all contributing to the success of our rural enterprises. This spirit of mutual helpfulness is what makes life worth living. There is immense satisfaction in any success achieved towards the solution of farmers' problems, for success for the investigator means success for the man on the land and, consequently, success for the whole community.

The School of Veterinary Science, University of Queensland.

By Professor E. J. GODDARD, Science Co-ordinating Officer, Department of Agriculture and Stock, Queensland.

THE inauguration of a School of Veterinary Science in association with the University of Queensland represents a very important development in the interests of the animal industries of this State. The necessity for such a school has long been recognised by those who have been brought into intimate contact with the problems confronting our animal industries. The actual attainment of this objective towards which a drive has been made—more particularly during the past five years—is due in no small way to the energetic and sustained interest of the present Minister for Agriculture and Stock, Mr. Frank W. Bulcock.

The School of Veterinary Science will serve for purposes of education and research in the first place. The existence of facilities for education in veterinary science in Brisbane will serve to attract many worthy Queensland students who, for financial reasons, would be unable to undertake such studies if Sydney remained the only centre where such facilities were available. It is hoped now that the assurance of posts in the field of veterinary science will draw students of first-class ability into that avenue of endeavour. The availability of scholarships which, it is understood, the Government intends to create during the coming financial year and the institution of cadetships within the Department of Agriculture and Stock will open the way to students of outstanding ability and aptitude for the work. In the modern attack on the problems associated with animal health and disease there is need for the help that can be rendered by such men, and to the scientific mind there are few problems that have a greater and more alluring interest than those confronting the veterinary scientist in this State.

Until recent years there were two Veterinary Schools operating in the Commonwealth—at Sydney and Melbourne Universities respectively. For various reasons the Melbourne school was closed, and Sydney then became the only centre where facilities for training were within reach of the veterinary student.

The creation of the Council for Scientific and Industrial Research and the development of a Division of Animal Health and a Division of Animal Nutrition gave an impetus to the cause of veterinary science throughout the Commonwealth. There was quickly realised the necessity for a survey of veterinary problems in Australia. The definition of the major problems soon indicated the need for investigations of a fundamental order, and there arose at once in that connection appreciation of the fact that one of the main difficulties was that of available first-class man power. When it became realised that demand exceeded supply of suitable men for veterinary research there began an increased enrolment of students within the Faculty of Veterinary Science at the Sydney University. The Council for Scientific and Industrial Research engaged the interest of Governments and pastoralists in the several States and undertook investigations in the States, these being assisted materially by its laboratories at the Universities of Adelaide and Sydney. Needless to state, the activities of the Council were curtailed considerably by financial considerations.

PLATE 165.

PROFESSOR H. R. SEDDON, D.V.Sc.

Dr. Seddon is the first professor of the newly-established Faculty of Veterinary Science within the University of Queensland, and was formerly the Director of Veterinary Research, Department of Agriculture, New South Wales.

In every way Queensland has co-operated with the Council for Scientific and Industrial Research, and has assisted that body materially by making available the Townsville Research Station and rendering financial help in that connection. We may take it as granted that Queensland will continue to co-operate in every way with the Council in its investigations.

There is, however, another aspect to consider. The creation of the Commonwealth Council, and its interest in animal investigations, by no means relieved Queensland of its responsibilities in respect of veterinary problems. It was still necessary for this State to carry out investigations and to maintain a veterinary service. The need for an efficient scientific staff for such purposes became apparent to the present Minister for Agriculture and Stock, who undertook the reorganisation of the Animal Health Station at Yeerongpilly and the creation of an Animal Health Board whose personnel included representatives of the Department of Agriculture and Stock, University, Council for Scientific and Industrial Research, Queensland Meat Board, Council for Agriculture, and medical profession. The difficulty of securing first-class scientific officers to meet the needs, dictated by a more and more serious attitude towards the veterinary problems of the State, gave impetus to the demand for facilities for training our own officers, and at the same time for providing facilities to Queensland students anxious to undertake veterinary studies. It was recognised that the instituting of a veterinary school would, further, stimulate interest in scientific research relating to animal problems and would also itself provide a centre of research. There has always existed a very efficient liaison between the University of Queensland and the Department of Agriculture and Stock in relation to agricultural problems, and it is anticipated that this same spirit of mutual co-operation in relation to the problems of the State will operate in relation to veterinary problems. The appointment of the Professor of Veterinary Science as Adviser to the Department of Agriculture and Stock augurs well for the attainment of that most desirable objective.

The value of a veterinary school to the State of Queensland cannot be exaggerated. Not only will it play an important role in providing a staff of first-class research officers and also itself act as a research centre, but, further, it will be the means for setting up in Queensland a scientific veterinary staff which will enable the Department of Agriculture and Stock to deal efficiently with all aspects of veterinary problems. This vast State includes large areas of varied classes of country with their own specific problems, and consequently arises the need for such decentralisation as shall ensure the presence of scientifically trained officers at numerous centres in the State. There is need not only for men capable of assisting in a scheme of co-ordinated research activities, but also capable of carrying out extension work on an efficient basis. Only a veterinary school in Queensland can properly meet the State's needs in this connection. What the Faculty of Agriculture has done and will continue to do on a more extended basis for the State of Queensland will be done by the Faculty of Veterinary Science in connection with animal problems.

In passing, mention may be made of fears and criticisms voiced in the South when the idea of organising a veterinary school in Queensland was first seriously mentioned. Reference was made in such quarters to the forced closing-down of the Melbourne Veterinary School; the lack of students; the possibility of an inferior training; the difficulty of securing a high-grade staff; the cost of maintaining a faculty on an efficient basis; the needless overlapping of activities with those of the Sydney school; the need for one school only in Australia; the desire for a national school, &c. It is now recognised, I believe, that these criticisms have lost their weight. There is no fear now in respect of the enrolment of students, and the position in Australia to-day is that the demand for first-class veterinary officers is greater than the supply. The University of Queensland has set up a five-years course, as in other parts of the world—and now Sydney proposes to do the same; we have secured as Professor one of the outstanding men in veterinary science in Australia; the school will be financed on as elaborate a basis as is that of Sydney; no school other than one in Queensland can meet the needs of this State in respect of supply of first-class men for research and extension work, or satisfy the requirements of the State in its influence on the veterinary service of the State.

In these days, the attainment of success in the attack on problems of major importance confronting the scientist is recognised as being dependent on efficient team work, and the organisation of team work is dependent on proper direction. We believe that a Faculty of Veterinary Science, acting in liaison with the Department of Agriculture and Stock, and co-operating with the activities of the Council for Scientific and Industrial Research, will organise team work on a most effective basis in Queensland, and will in years to come be regarded as the means whereby a belated but serious scientific attack on a large and continuous scale on our animal problems was launched in Queensland.

Queensland is in the mood to-day under an energetic Minister to reorganise its activities in relation to agricultural and pastoral problems. Attention is being organised towards a thorough scientific handling of the problems associated with pastures, beef cattle, dairying, &c., and the available talent of the State is being co-ordinated. Without any intention of discounting the excellent work done in the past by officers of the Department of Agriculture and Stock and the University, we may say that we are witnessing the birth of a new epoch. Too long has Queensland remained in respect of agricultural and veterinary science the Cinderella of the Eastern States. We are awake to our needs and there is the mood to respond. We carry heavy national responsibilities in the State of Queensland, and the spirit now operating in an attempt to discharge those responsibilities is gratifying and encouraging.

The existence of a Veterinary School, and the concomitant inauguration of a Medical School providing facilities on the physiological and pharmacological side, will enable us to tackle problems such as those relating to poison plants—wild and domesticated—on an efficient basis. In this connection animal nutrition, so important to our cattle and sheep industries, will receive special attention, and we can look to organisation of team work in connection with our pasture-problems—investigations on a co-operative basis. There is to-day a growing consciousness that we must look to human and animal welfare from the angle of health rather than disease; and the problems of nutrition are looming large on the horizon. The School of Veterinary Science in Queensland will give special attention to such, and thus will function to a considerable extent as a School of Animal Husbandry. It is to be anticipated that the interest and confidence of those concerned in the animal problems of Queensland and the advancement of our animal industries will be engaged in this new and much-needed development.

The University of Queensland is fortunate in having secured the services of Dr. H. R. Seddon as its first Professor of Veterinary Science.

Born in New Zealand, he received his early training in veterinary science at the University of Melbourne, where he graduated as Bachelor of Veterinary Science with first-class honours. He gained his Doctorate in Veterinary Science in 1921, on the presentation of a thesis dealing with contagious abortion. Professor Seddon has been engaged in veterinary scientific work since 1907 in various capacities and, in that connection, has been associated with the New Zealand Department of Agriculture, the University of Melbourne, the Australian Army Veterinary Corps (on active service), the University of Sydney, and the Department of Agriculture, New South Wales. In the Universities of Melbourne and Sydney he has occupied several lectureships. Since 1924 Professor Seddon has been Director of Veterinary Research, Department of Agriculture, New South Wales. In addition to his experience as a lecturer, he has long research experience associated with veterinary institutions—Melbourne, London, and Glenfield (N.S.W.); and has visited the leading institutions in Great Britain, Holland, Denmark, Sweden, Germany, and South Africa.

He has published on his own account or jointly over 130 papers and articles dealing with various diseases of live stock. These include articles embodying research work on tuberculosis, blackleg, contagious abortion, contagious bovine pleuro-pneumonia, tick fever, botulism, mycotic dermatitis, arthritis in sheep and pigs, caseous lymph-adenitis, swine fever, infectious laryngo-tracheitis, and pullorum disease of fowls, &c.; the following parasites—sheep blowfly, liver fluke, tapeworms, stomach and bowel worms, sheep tick, &c.; nutritional studies, including the value of various minerals to stock; and poisonous plants.

Professor Seddon thus comes to us as a veterinary scientist with high academic distinction, very considerable teaching experience, a long record of scientific investigation and scientific administration, a wide experience of Australian conditions and animal problems, a knowledge of veterinary scientific activities in the leading research centres of the world; and with a reputation of high standing in the Commonwealth and other parts of the world.

A Recent Army Worm Outbreak.

Cat. 17.2

By J. A. WEDDELL, Entomologist.

TOWARDS the middle of March inquiries were received regarding the control of caterpillars attacking fodder crops and pasturage in the near Brisbane areas. For a few succeeding days the inquiries increased in numbers, but were still limited to districts within about 12 miles of the city, giving rise to the opinion that the caterpillar outbreak was of somewhat local significance. By the end of the week, however, reports of attacks were streaming in from widely separated districts. Specimens of the caterpillars were submitted by inquirers, and also the insects were personally observed in the field in a number of the districts affected. The caterpillars were provisionally referred to the genus *Spodoptera* and, when adults were later bred out, the species *Spodoptera exempta* Walk. was found to be wholly responsible for the outbreak. The following observations were made during the outbreak.

Distribution.

The species was previously known to be widely distributed, so that it was not particularly surprising from one point of view that serious infestation was recorded in Queensland from districts as widely separated as Rathdowney, near the south-eastern boundary, and Rockhampton, in the central coastal area, and as far west as Jandowae, on the Darling Downs, over 120 miles from the coast. Notes in the public Press also indicated that similar attacks were being experienced in the Northern Rivers district of New South Wales.

The main damage occurred from Gympie southwards, on the Blackall Range, in the farming areas around Brisbane, such as Samford, Strathpine, Brookfield, Moggill, in the Ipswich district, along the Fassifern Line south to Boonah, where large areas were involved, and across to the Beaudesert district.

It is interesting to note that conditions must have been uniformly favourable over a wide belt of country for the almost simultaneous appearance of unusually large populations of this one species. One cannot help attempting an association of ideas in that, during the recent summer, South-eastern Queensland experienced first an epidemic outbreak of the Rutherglen bug, *Nysius vinitor* Berg., attacking mainly market garden crops, which lasted about three months, closely followed by swarms of the red-shouldered leaf beetle, *Monolepta rosea* Blkb., in maize, figs, cotton, and other important crops, not to mention garden and ornamental plants. Now the series has been rounded off by the army worm outbreak.

Damage and Importance.

In most cases the damage first noticed was on fodder crops of recent planting which had been planned to fill the needs of winter feeding of stock. Almost the whole range of graminaceous fodder crops grown in the localities mentioned were recorded as being seriously affected—wheat, maize, giant panicum, sorghum, saccaline, imphee, Japanese millet, and Sudan grass. Young plantings having from 6 to 12 inches of growth were particularly severely damaged owing to the attractiveness of the plants and also to the relatively small amount of food such a stand represented. As a consequence an invasion of caterpillars was capable of moving rapidly through such a young crop and completely denuding several acres in a few days. Many such examples were seen; one patch of young sorghum, two to three weeks old, 9 inches high, 5½ acres in extent, was wiped out in four days, while an area of 5 acres of giant panicum containing two strips 6 inches and 12 inches high respectively was almost completely eaten in three days. In general such young plants were eaten down to short stalks, many plants being cut to the ground. It is very doubtful whether there could be any satisfactory regrowth even from the less damaged of the plants.

PLATE 166.

Mature Caterpillars invading Sorghum.

A certain preference for the younger growth is demonstrated in Plate 167, where there are shown, in the area denuded of giant panicum that had attained 6 inches of growth, a few volunteer sorghum plants, approximately 18 inches high, which were passed by the main invasion of caterpillars. Serious damage occurred in crops up to 2 feet in height (Plate 166), but owing to the greater body of feed available to the caterpillars their progress was slower and more time was available to apply arresting measures. In plants of this size the flag was stripped to the midrib and the residue of the crop appeared as strawlike wisps. These plants would give regrowth, but naturally the crop would be greatly reduced. With still older plants the damage tended to be restricted to the lower leaves, not however without exception, and the severity of loss was somewhat in the nature of an inverse ratio to the age of the crop. Very little damage was seen, for instance, on maize in cob.

Other than the fodder crops abovementioned, no other cultivation was recorded as receiving damage. Freedom from injury was strikingly illustrated in the case of lucerne. Many patches in varying stages of growth through which caterpillars had recently swarmed, or were actually working, were examined. The lucerne was completely unharmed, while the unwanted grass and nut grass growth that was diluting the crop was mainly removed by the caterpillars. In several instances where the lucerne was ready to cut the work of the caterpillars ensured a beautifully clean crop. This chance benefit naturally was a very small offset to the widespread damage.

PLATE 167.

Showing the temporary preference for the younger plants. Area denuded of giant panicum 6 inches high; older volunteer sorghum plants, for the time being, undamaged.

In many localities, particularly the more closely settled, infestation commenced in the cultivation and swarms later migrated to the neighbouring grass paddocks, completely denuding the infested area of edible grass. In the more open grazing paddocks and on larger properties, it appeared that the farmers had noticed spreading yellow spots scattered through the pasture; these were later realised as being due to the caterpillars. As the insects fed outwards the individual areas grew larger and frequently coalesced with neighbouring areas so that large tracts became uniformly bared by the caterpillars. This is well instanced by mentioning one property of about 7,000 acres in the Boonah district, which, prior to the outbreak, had been nicely covered with about 3 inches of grass, mainly paspalum of recent growth—a good promise for the winter. At a conservative estimate not less than 2,000 acres were eaten bare by the caterpillars. (Plate 168.)

Along the Fassifern railway line it was possible during the outbreak to distinguish large areas of pasture slopes, up to 5 miles away, characteristically brown as a result of the attack.

On pastures the green edible grass foliage was taken by the caterpillars. Old grass and hard grass stalks, clumps, and so on were left; most of the weeds were unaffected, but nut grass, *Cyperus rotundus*, whether among grass, in cultivation, or as an almost pure stand on a temporary fallow, was eaten. Clovers, like the lucerne, were not affected.

PLATE 168.

The slightly darker area to the left middle distance margining the buildings is undamaged pasture. The remainder of the landscape was denuded; as in the immediate foreground only dry grass tufts and stalks were left.

Had such an invasion occurred during the summer with the promise of regrowth, even the denuding of large tracts would have been of little consequence. This attack took place, however, in the autumn and the chances of the growth of a satisfactory body of feed must be recognised as being very slight, and where young fodder crops were destroyed, insufficient time remained in most cases to allow of preparation and planting to permit of a satisfactory growth before winter. Rain fell during the outbreak, but the immediate regrowth was taken. Since then the weather has become mainly fine and cool, that is, it is seasonably unsuitable for rapid growth of pastures. The attack may therefore be responsible for a shortage of winter feed in a number of dairying and pastoral districts.

Life History and Habits.

Life history studies were not carried out during the present outbreak, but the elements of the life cycle of a very closely allied species,
406 *Spodoptera mauritia* Boisd., were discussed by Smith* following the

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* Smith, J. H.—Caterpillar Plagues in Grasslands and Cultivation Paddocks. "Qld. Agr. Jour.," April, 1933.

1931-32 outbreak. For the sake of present completeness his remarks regarding development are summarised as being probably of some interest. The developmental forms of the two species are sufficiently similar to be indistinguishable in general illustrations.

The eggs (Plate 170, fig. 2) are tiny bun-shaped objects, pale white, iridescent. They are laid in clusters of from 100 to 200 eggs, either on the ground or on the flag of the host pasture plant. The egg clusters are sparsely sprinkled with dark hairs detached from the body of the female, giving the egg mass a somewhat dark appearance.

Plate 169.

Showing the somewhat aimless wandering of caterpillars when crossing a road.

The first stage larvæ are pale in colour. Mature caterpillars (Plate 170; figs. 3 and 4) are typically striped longitudinally in shades of green and sometimes white. Caterpillars in about the third and fourth instar are mainly black. The older larvæ have a characteristic white V marking on the head. Smith recorded the caterpillars as pupating in the soil and sometimes under dung, but during the recent outbreak pupation appeared invariably to take place in the soil although search elsewhere was made.

The adult of *S. exempta* (Plate 170, fig. 5) is a fairly typical Noctuid with forewings and thorax dark-brown, and paler hindwings. It can be recognised from the illustration without further description.

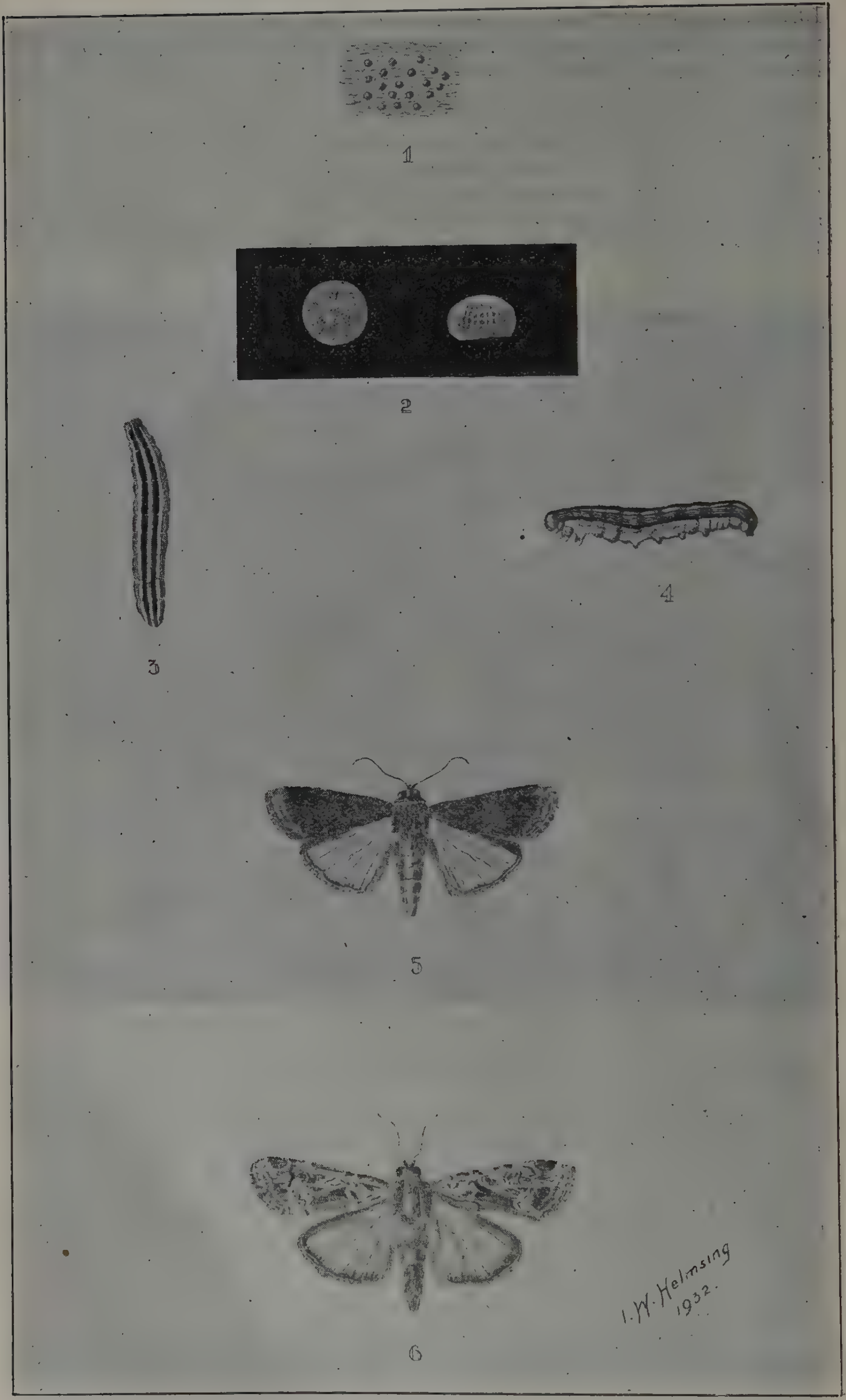
1
2
3
4
5
6
I. W. Helmsing
1932.

PLATE 170.

Smith found the developmental stages of *S. mauritia* to occupy the following periods, the work being carried out in North Queensland in February:—Egg, 7 days; larva—1st stage, 2 days; 2nd stage, 4 days; 3rd stage, 3 days; 4th stage, 1 day; 5th stage, 3 days; total, 13 days. Pupa, 7 days.

However, it was found in handling insects of the present outbreak that the pupal period was approximately ten days, a 50 per cent. increase that probably was due more to temperature differences caused by time of year and location, than to any slight specific differences. A total larval period of about three weeks was approximately correct for the present outbreak.

Even with the earliest inquiries the caterpillars were then about one-third grown. This is understandable in that grass and fodder crops are not closely examined as are, for instance, vegetables and fruit. It was not until the mass effect of the injury had shown to a noticeable extent and awakened curiosity as to the cause that the caterpillars were discovered. It was not generally realised, or believed, that the insects had originated from eggs laid something over a fortnight earlier and that the caterpillars had been present for some time prior to detection. There was, however, no possibility of overlooking the work of the insects during the later portion of their larval life. Certain farmers in affected districts remembered that some three weeks prior to the first noted appearance of the caterpillars there had been a noticeable influx of brownish moths to lights at night.

The caterpillars usually had spread out well when first seen. Where the growth was relatively short, young fodder crops and short grass, the caterpillars worked forward in a definite line. This line was frequently 12 to 18 inches in width, and in length distances of 100 and 200 yards were measured on small farms. On more than one cattle area almost continuous lines extending a mile or more were seen, these evidently representing the coalescence of many originally separate infestations as earlier described. This linking up of colonies was seen in progress from day to day on one property. The forward movement of a line was imperceptable during short periods, but in one case overnight the line advanced 20 feet over a long front on paspalum. Although there was a general forward movement and the line was maintained fairly continuously, numbers of stragglers yet remained in the rear and these were doubly important; firstly, because insects remained spread over the area in numbers sufficient to deal with any immediate grass regrowth; secondly, because of their relationship to certain control measures suggested or tried by farmers and others. The latter aspect will be touched on again. In support of the first point, an average of ten caterpillars per square yard was found at a distance of several hundred yards behind the then front line, and these were seen to be nibbling the tiny green shoots of otherwise brown grass. Further, while the caterpillars were

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PLATE 170.

Spodoptera mauritia Boisd.

Fig. 1.—Egg mass x 2½ (after Smith).
Fig. 2.—Egg, dorsal and lateral view x 25 (after Smith).
Fig. 3.—Larva, dorsal view, natural size.
Fig. 4.—Larva, lateral view, natural size.
Fig. 6.—Adult, natural size.

Spodoptera exempta Walk.

Fig. 5.—Adult, natural size.

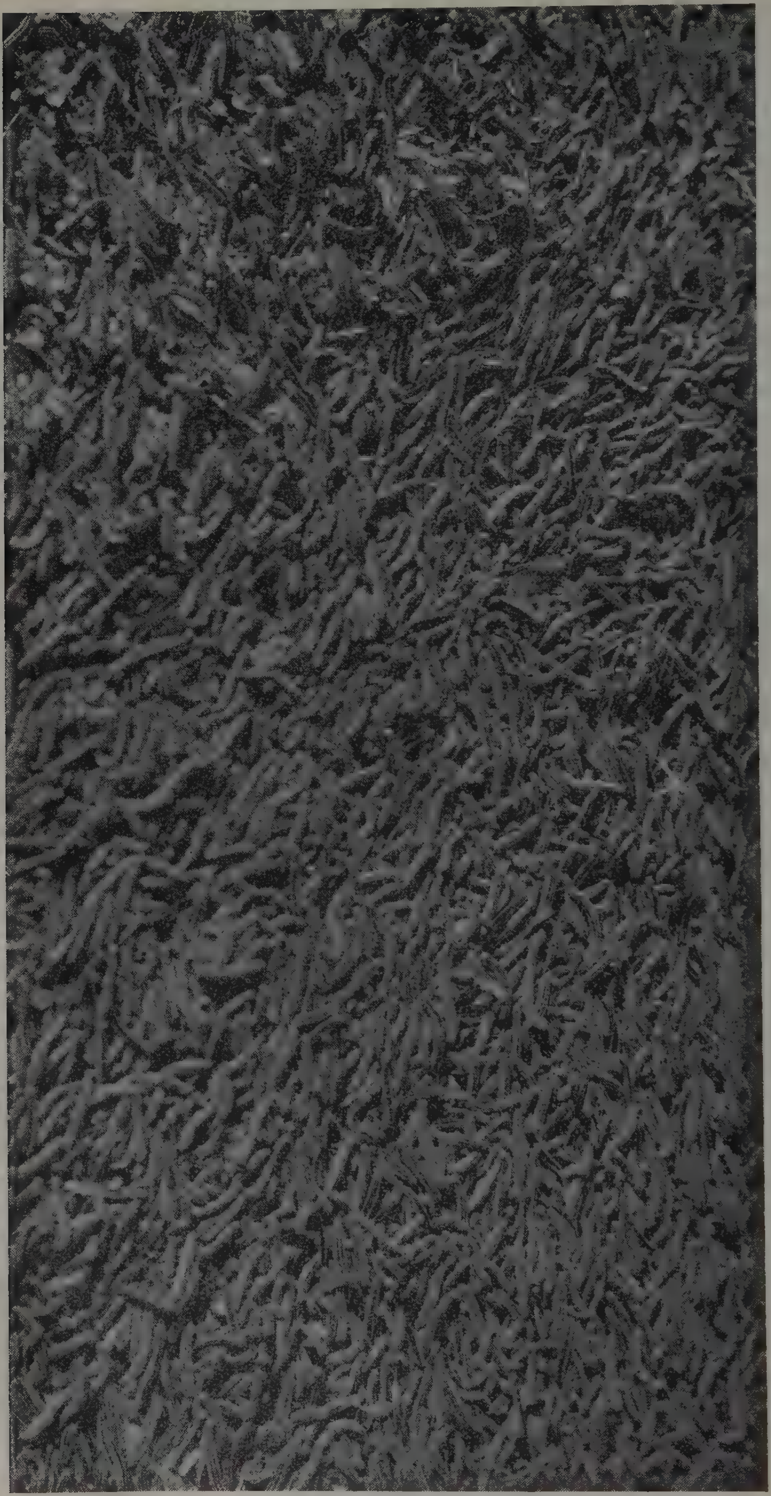


PLATE 171.
Small portion of dense swarm congregated at side of road preparatory to crossing.

present the pasture remained uniformly brown, but on one property on the day following the almost simultaneous disappearance of the caterpillars underground for pupation, a green tint became noticeable over the area.

Natural Control.

Birds are very definitely great friends of man in the control of insect pests, but there are occasions when too much is expected of them. This was rather the case in the present outbreak. Ibis probably did the best work when flocks of them returned every day to the one locality and practically cleaned it up. Other birds—starlings, crows, magpies, peewits, and domestic poultry—fowls, ducks, and turkeys—did good work in that they killed large numbers, but their efforts were too diffuse to be of any practical significance. While birds do invaluable work throughout every year in insect control and every effort should be made for their protection, it is not to be expected that they should be able to have any generally marked effect on a sudden widespread invasion of insects, even such edible and easily captured insects as caterpillars.

Towards the end of the epidemic generation of caterpillars certain insect parasites were seen to be active, in particular a small Braconid wasp, *Apanteles* sp. and a large Ichneumonid wasp, *Lissopimpla semipulata* Kirby. The cocoon masses of Apanteles were readily found, being usually attached to dry grass stalks. These were numerous throughout the infested areas of the Beaudesert, Boonah, Ipswich, and Moggill districts. The adults of Lissopimpla were seen working over the caterpillars, and also over the ground in which mature caterpillars had burrowed for pupation. A Tachinid fly was also recorded. No doubt other species were present also taking toll.

Climatic factors should also operate towards reducing the possibility of any immediate reattack as, with the fall of day and night temperatures, the rate of breeding will be greatly diminished.

Artificial Control.

Artificial control will be discussed under the headings (*a*) bran bait, (*b*) sprays, (*c*) flame thrower, and (*d*) mechanical methods.

Bran Bait.

The standard recommendations for dealing with an army worm outbreak involve the use of a poison bait. The particular mixture recommended in this instance was prepared by thoroughly mixing while dry 1 lb. Paris green with 25 lb. bran. A quart of molasses was then dissolved in a little water and made up to 2 gallons by the addition of further water. That quantity of fluid was usually sufficient when mixed thoroughly into the bran and Paris green to produce a moist but loose and crumbly mash. Where molasses is plentiful the quantity may be increased to ½ gallon to some advantage as the mixture appears then to remain moist for a longer period, thus increasing the period of attractiveness. Almost invariably it is recommended that this bait be laid in the late afternoon, but on the larger holdings where infestation occurred this would not allow sufficient time for the completion of a reasonable proportion of the work before nightfall. Consequently it was suggested that for any bait which had of necessity to be laid during the daytime or in dry weather the total fluid should be increased to 2½ gallons per 25 lb. bran.

Where the caterpillars were advancing as earlier described, the method was to broadcast the bran bait by hand along the line so that of the 6 to 8 feet wide throw about one-half lay in front of the caterpillars and the remainder over and behind the main line. Distributed as recommended the quantities given above were sufficient to bait a line approximately one-third of a mile long at a cost for materials of between 5s. and 6s. Naturally there needs to be some discretion as to quantities, increasing them where the caterpillars are numerous and possibly later rebaiting short strips where some may break through.

Where soil conditions were suitable the drawing of a furrow a few feet in front of the line of caterpillars was recommended as an additional measure, the plough preferably to be returned over the original cut so that the final throw of soil was towards the caterpillars. The caterpillars thus needed to climb a vertical face in order to spread further and bran bait scattered thinly in the furrow was readily accessible to them. This method had particular application in protecting cultivations but could be considered also on many pasture areas.

The bait is definitely poisonous and was therefore handled with care, the mixing utensils and hands being thoroughly cleaned after its preparation and application. So far as farm stock is concerned the bait cannot be guaranteed to be absolutely safe. At the same time any danger can only be regarded as very slight if the recommended thin scatter be applied. The following arguments support this attitude.

1. The bait is applied thinly and it tends to trickle to ground level, out of reach of stock.

2. Stock naturally do not frequent the areas rendered bare or occupied by the caterpillars but feed on the undamaged pasture.

3. Although this and comparable baits have been rather extensively used in the past in Queensland, no cases of stock poisoning have been reported. As an added safeguard, however, stockowners may consider transferring stock to unbaited paddocks for a few days.

The bait was demonstrated to be effective in stopping the advance of the caterpillars on normal pastures, among sorghum, and in thick nutgrass. In the pasture and among the nutgrass, portions of the lines were pegged and baited. In each case on the following and subsequent days the caterpillars on the contiguous unbaited sections had advanced normally, still in a clearly defined line, while on the baited strip the damage had ceased practically on the pegged line and there was a shading off of the damage, the ground being heavily sprinkled with dead and dying caterpillars with few survivors. In sorghum a fine result was seen following baiting on the part of the grower. The sorghum had been planted in drills 2 feet apart and there were 10 to 11 acres 2 to 3 feet high, of which approximately 1 acre was destroyed before the farmer was aware of the attack. The bait was applied in a thin scatter on the ground between the drills. Pegs were inserted to mark the limit of the damage at the time of baiting, and some three days later it was found that the damage had not extended and few living caterpillars remained, dead caterpillars being numerous about the ground.

In grass of somewhat tall or rank growth and in well-grown fodder crops sown broadcast, control was by no means good. Most of the bait trickled to ground level and the caterpillars were able to move from plant to plant without approaching the bait. The only method of limiting the damage under such conditions was to mow or scythe a strip between the infested and undamaged portions, to rake the cut grass or fodder from that strip, and then preferably to draw one or two furrow lines. The bait broadcast over this cleared strip would be readily accessible to the caterpillars as they migrated.

Sprays.

There were a number of inquiries for a non-poisonous method of control so it was decided to try a spray consisting of a crude oil emulsion. The method of mixing was as follows, being the same as for kerosene emulsion, crude oil being substituted for the kerosene. Half a pound of hard soap was dissolved in a gallon of water by boiling, the container being then removed from the fire and 2 gallons of crude oil immediately added to it. The mixture was then stirred vigorously and churned by means of a spray pump for five to ten minutes. This stock solution, when properly emulsified, has much the appearance of strong milk coffee, and it was found that the emulsion held for a week or more. For use the stock solution was diluted one part of stock to seven parts of water. Mixed ready for use the spray fluid costs something less than ¾d. per gallon.

This spray gave the anticipated good results in that it killed a high percentage of the caterpillars receiving it. A number of sprayed caterpillars were enclosed for observation, and it was found that of 260 individuals, 258 were dead and 2 alive at the end of eighteen hours. Unsprayed larvæ held under similar conditions all survived. The spray similarly gave a kill in rather persistent showery weather, but in this instance the result was not fully satisfactory.

The spraying method is one that could be applied by the man with a small acreage who perhaps could work over and spray the whole of the infested area. The method would be invaluable also for dealing with incipient swarms before the infested area was extensive, and for use while awaiting supplies of baiting materials in the case of a wider infestation. It must be pointed out that all above-ground portions of plants with which the spray came in contact, were killed. These, however, would be eaten down by the caterpillars in any case if no control measures were adopted.

In the case of large swarms it is possible to apply any selected treatment only to the dense marginal strip of caterpillars. It was found, however, that if the "front line" were killed by spraying then by next day those that had seemed mere stragglers had advanced and reformed a line and were working on as before, a line of dead, behind, indicating where the spray was applied. It was thus shown that several repeat sprayings would be necessary in order to deal with a large swarm by marginal spraying. This was in distinct contrast to the almost complete stoppage imposed by broadcasting bran bait on the margins and thus providing a poisoned zone.

Flame Thrower.

This type of apparatus received much publicity for caterpillar control. It was possible to attend a demonstration and later several areas that had been treated were inspected. The results obtained with a flame thrower were disappointingly slow compared with the quite spectacular flame jet emitted by the apparatus. Caterpillars in grass or herbage were somewhat protected by the moisture of the foliage and only by subjecting them to the fierce direct jet were they satisfactorily dealt with. On contact with the ground the flame spread out to quite a large tail, but this tended to rise and affected only those caterpillars that had climbed grass stalks and so on, becoming thus enveloped in the flame. It appeared that flaming would need as careful and slow work as the spraying above described. Even where quite extensive flaming had occurred it was noticeable that the advance of caterpillars had not been checked even though large numbers of dead were present on the flamed areas, and in this respect also the flame thrower was comparable with the spray pump in its effects. Where, however, a farmer had a flame thrower available it would be capable of good work in dealing with incipient swarms.

Mechanical Methods.

Improvised mechanical methods, attempting to check the caterpillars were seen in many centres. These included the use of tennis court rollers, agricultural rollers, the dragging of weighted branches along the swarms, and running motor vehicles up and down the line. Even where good kills were obtained, in most cases the line was reformed by the congregating of stragglers, and extension of the damage proceeded as before.

General Considerations and Conclusions.

It will be realised that this epidemic occurred at an unfortunate time of year, so far as dairymen and cattlemen were concerned, in that young fodder crops planned for winter, and also a healthy cover of pasture, were destroyed with little prospect of satisfactory regrowth occurring prior to winter. In this connection it appears more than ever desirable for stockowners, where possible, to make some provision for fodder conservation from year to year by stacks and ensilage in order to meet such unpredictable periods of shortage as those caused directly by the weather, such as rain shortage, or indirectly by climatic conditions and other factors favourable to an epidemic such as that recently experienced. Further, in connection with insect pests of fodder plants, it would be wise planning where it is possible, to grow more than one type of fodder crop. For example, it was recently demonstrated that whereas the graminaceous plants were destroyed, lucerne was untouched. By having areas of such different plant types available there would be a much greater safeguard against individual insect epidemics than exists when all the available cultivation is under the one crop.

With regard to epidemic attacks of army worms the control measure that appears most practicable is the use of the poison bran bait. It is cheap, easy to mix and apply, and the results have been satisfactory. Spraying with crude oil emulsion or other similar mixture, and the use of flame throwers may have their place as mentioned. It must be remembered that time is the really important factor, as each day's delay means a greater amount of injury caused, and a wider area to be worked over in order to effect control. A man on a large holding may be depressed, feeling that the task of control is beyond him, but at least he should decide to protect his best areas, and probably the results obtained there will inspire a considerable extension of the original plans.

The Tobacco-growing Industry in the United States of America.

Cat. 14

By L. F. MANDELSON, B.Sc.Agr., Plant Pathologist.

DURING the period 9th January to 15th November, 1935, a tour was made of the United States of America with the object of observing various aspects of the tobacco industry in that country. The cost of the trip was met from Queensland's share of the Federal Tobacco Vote. Several reports on general observations and on special subjects were submitted whilst overseas, and the object of this general report is to co-ordinate and summarise the matter contained therein and to incorporate where necessary fresh material in order to give a more complete account of the production of the various classes of American tobacco. An attempt has been made to describe the flue-cured tobacco industry in some detail, since this class of tobacco is cultivated in Australia. Other tobaccos, such as fire-cured, air-cured, and cigar tobaccos, are much more briefly discussed. It is realised, however, that it is difficult to both briefly and accurately discuss an industry as huge as that of tobacco production in America, which involves numerous tobacco types with divers methods of handling, and many classes of soils and variations in cultural practices. Consequently the original reports are probably more strictly accurate where specific subjects are discussed in detail, but the present account may give a more complete picture of the tobacco industry as a whole.

Prior to leaving Sydney the British Australian Tobacco Company's factories were inspected in Sydney. Subsequently cigarette factories were observed in North Carolina and cigar factories and packers' warehouses in Florida and Connecticut. Various stages in the cultivation of flue-cured tobacco were seen mainly in South Carolina, North Carolina, and Georgia. Other types were observed in Virginia, Florida, Tennessee, Kentucky, Maryland, Massachusetts, Connecticut, Pennsylvania, and Wisconsin. Some of the Southern States were visited two or three times in order to follow the progress of the crops. Tobacco sales and redrying plants were inspected. Inquiries into various phases of pathology, entomology, and plant nutrition were made at the United States Department of Agriculture at Washington, and at numerous Universities and Experiment Stations in the above-mentioned States, as well as in others where tobacco was not of great economic importance. At all institutions visited the writer was given the utmost attention and courtesy. Helpful information, office facilities, and transport on many occasions, were made available, and the success of the tour was largely due to the co-operation and kindness of the numerous research workers and tobacco specialists met while engaged in this work.

TOBACCO STATISTICS.

In reviewing American tobacco statistics it appears that over a long period of years the production of some classes has increased tremendously, whereas others have lagged behind according to changes of fashion in tobacco consumption. Thus 141,200,000 lb. of Kentucky and Tennessee fire-cured tobacco, which is used mainly for snuff and smoking mixtures, were produced in 1912, while in 1930 there were 134,800,000 lb. produced, although the figure for the previous year was 155,000,000 lb. Hence apparently the industry has not expanded appreciably during that period. On the other hand, there were 187,540,000 lb. of flue-cured tobacco produced in 1912, and 864,276,000 lb. in 1930. Since the war the tendency has been for tobaccos used in cigarette manufacture, such as flue-cured and Burley, to increase greatly in production at the expense of other classes used for cigars, chewing, and snuff. Manufactured tobacco figures indicate that tobacco used for chewing, smoking, and snuff decreased from 435,000,000 lb. in 1912 to 372,000,000 lb. in 1930, manufactured cigars from 8,099 million to 6,276 million for the same period, whereas the number of cigarettes manufactured increased from 13,173 million to 123,810 million. Other factors, such as the advent of the cotton boll-weevil, have no doubt had the effect of also increasing the area under tobacco.

Production statistics from year to year show rather wide fluctuations. This is mainly due to the fact that there is ample suitable land available for the expansion of the tobacco growing area, and consequently the area under crop had a tendency to fluctuate in direct proportion to the prevailing price paid. For example, 659,500 acres of flue-cured tobacco were planted in 1922 and sold at 27.2 cents per lb. The previous year the price had been 21.9 cents.; consequently 804,800 acres were planted in 1923 and the average price dropped to 20.8 cents.

Abnormal fluctuations in production and prices were very marked during the few years prior to 1934, and were apparently due to farmers planting increased acreages in an endeavour to meet their indebtedness during a period of depressed prices. Such action resulted only in an accumulation of surplus stocks. During the period 1927 to 1930 the average production of flue-cured tobacco was about 750 million lb. and sold for 18 to 20 cents. Subsequently production fluctuated with a crop of 850 million lb. as its peak and with prices steadily dropping to 10 or 11 cents per lb. A similar state of affairs obtained with the production of other classes of tobacco. However, in 1933 the Agricultural Adjustment Administration was formed with the object of adjusting production of agricultural crops in general, since prices for all farm products were then severely depressed, and restoring former purchasing power. During that season it arranged an agreement between tobacco producers and buyers whereby prices were materially improved, and subsequently it has restricted and controlled production.

In 1935 the area planted was reduced to 85 per cent. of the normal or "base acreage," in the case of flue-cured tobacco, to 60 per cent. for Burley tobacco, and to 80 per cent. for both fire-cured and dark air-cured tobaccos. In consequence the prices obtained were considered generally satisfactory. It is considered that it costs about 16 cents to produce 1 lb. of flue-cured tobacco leaf and that the parity market price is about 20 cents. At present flue-cured tobacco is selling at about 25 cents per lb.

Table I. on American Tobacco Statistics gives data on the production of various classes of tobacco in 1933, and indicates the acreage and relative importance of various classes of tobacco and tobacco belts. It will be noted that more than half the total acreage in the United States is flue-cured, and that the average yield for that class in 1933 was 778 lb. per acre. Burley tobacco comes next in importance. During that year about 1,400 million lb. of tobacco of all classes were produced in the United States on approximately 1,754,000 acres.

The proportion of the tobacco crop which was grown in 1930 in the various States is given by Hayes and Lein in "Tobacco Growing in Minnesota," as follows:—North Carolina, 35·8 per cent.; Kentucky, 22·8 per cent.; Virginia, 6·9 per cent.; Tennessee, 7·7 per cent.; South Carolina, 6·0 per cent.; Georgia, 6·4 per cent.; Pennsylvania, 2·4 per cent.; Wisconsin, 3·2 per cent.; Ohio, 2·8 per cent.; Connecticut, 2·0 per cent.; Massachusetts, 0·7 per cent.; New York, 0·05 per cent.; Minnesota, 0·2 per cent. These figures refer to all types of tobacco and it should be noted that while some States produce only one class of tobacco others produce several. The tobacco crop in the United States in 1930 was worth 211,102,000 dollars.

TABLE I.

United States Tobacco Statistics.

Preliminary Figures for 1933 extracted from the 1934 "Year Book of Agriculture" of the United States Department of Agriculture.

Class and Type.	Acreage Harvested.		Yield per Acre.		Production.	
	Acres.		Lb.		1,000 lb.	
Flue-cured—						
Old Belt	316,100		699		221,029	
Eastern North Carolina Belt	357,000		790		282,030	
South Carolina Belt	167,200		860		143,775	
Georgia-Florida Belt	70,800		871		61,654	
Total		911,100		778		708,488
Fire-cured—Total		174,000		796		138,455
Air-cured (light)						
Burley	515,400		808		416,252	
Southern Maryland	32,200		550		17,710	
Total		547,600		792		433,962
Air-cured (dark)—Total		53,100		787		41,801
Cigar Filler—Total		37,100		944		35,010
Cigar Wrapper—Total		6,000		1,026		6,153
Cigar Binder—Total		24,300		1,316		31,989
Miscellaneous Types—Total		500		636		318
United States		1,753,700		796·1		1,396,174

WHERE TOBACCO IS GROWN.

Tobacco is grown mainly in the south-eastern portion of the United States, but certain types are also grown in various Eastern States and as far west as Wisconsin and Minnesota.

Flue-cured tobacco is grown in northern and eastern North Carolina, eastern South Carolina, southern Virginia, southern Georgia, and to some extent in northern Florida. Dark fire-cured is grown in western Kentucky and Tennessee and also in central Virginia. Dark air-cured types are produced in southern and western Kentucky, northern Tennessee, southern Virginia, and in southern Indiana. Perique tobacco, which is a unique type of little importance, is air-cured and is grown in a restricted area in Louisiana. Of the light air-cured types, Maryland tobacco is grown in southern Maryland, and Burley tobacco in north-central Kentucky, eastern Tennessee, southern Ohio, south-western West Virginia, and south-eastern Indiana. Cigar wrapper tobaccos are produced in the Connecticut Valley of New England, and in northern Florida. Cigar binder tobacco is grown mainly in Wisconsin and in portions of Pennsylvania, New York, and Minnesota Pennsylvania and certain sections of Ohio and New York produce most of the cigar filler tobacco. A limited amount is also grown in northern Florida and in Georgia.

THE AMERICAN TOBACCO SEASON.

Since the United States lies in the Northern Hemisphere, the incidence of the various seasons is reversed in respect to Australia. With the approach of spring, warm weather gradually progresses from south to north and tobacco planting consequently progresses in a similar fashion.

The seed is sown in the winter, during January or February in the Southern States, and the seedlings are pulled about three months later. With flue-cured tobacco the planting season commences in Florida and Georgia and extends from the third week in March to the 20th April. South Carolina and the New Belt of North Carolina plant during April until 5th May in the more northern sections, and the Old Belt of North Carolina during May and until the 10th June in the north-western areas. In Virginia plants are set from 12th May to the 1st June. The crops are harvested two to three months subsequent to the time of setting plants in the field.

Cigar tobacco is planted in Florida about the same time as the flue-cured tobacco. It has been found that if planted late, such as subsequent to mid April, nematode damage is considerably accentuated. The crop matures in about two months. Cigar filler and binder tobaccos are set out from the latter part of May to mid June in Pennsylvania, and are harvested in September. The season is somewhat similar in the more northern districts.

The Burley and Maryland tobaccos are set out in May or early June and are harvested in August and September.

The preciseness with which tobacco is set out at a definite time for specific districts is remarkable. This is partly due to the severity of the winter, which naturally determines how soon plants will be large enough for transplanting, and also to the long experience of most growers. The time of planting within narrow limits markedly influences the subsequent growth of plants in the field and the quality of the leaf produced.

CLASSES AND TYPES OF TOBACCO.

The characteristics of tobacco are more influenced by environment than those of most other agricultural crops. Since it is grown from the Canadian border to Florida on various types of soil and under different climatic conditions, tobacco naturally varies very considerably in characteristics. Other factors influencing its characteristics are differences in varieties of seed grown, the result of selection or introductions for specific purposes, and different methods of handling the crop. These variations are responsible for its division into a wide range of types. Altogether twenty-five distinct types of tobacco are recognised in the official classification of the United States Department of Agriculture. Manufacturers through long experience know the characteristics of tobacco peculiar to certain districts, and hence buy with complete confidence from specific districts for their various leaf requirements. In short, the tobacco industry in the United States is extremely specialised, and frequently quite small areas, such as Maryland, may produce a type of tobacco which is unique and peculiar to that area.

Tobacco is officially classified into six classes. They are (1) Flue-cured; (2) dark fire-cured; (3a) light air-cured; (3b) dark air-cured; (4) cigar binder; (5) cigar filler; and (6) cigar wrapper. They are further subdivided into many types such as Burley, various cigar and flue-cured types, One Sucker, Maryland, &c., according to their distinctive characteristics, and the districts where they are grown. Each type is given a distinctive number—e.g., U.S. Type 5, U.S. Type 12.

Various classes of tobacco are purchased for specific purposes. Flue-cured and Burley (light air-cured) tobaccos are used in the manufacture of cigarettes, smoking mixtures, and chewing tobacco. Fire-cured tobacco is used for snuff, smoking mixtures, and certain classes of cigars. Dark air-cured is used in chewing tobaccos and smoking mixtures. As indicated by their names, the various cigar classes are used in the manufacture of the filler, binder, or wrapper portions of cigars. Scrap cigar leaf is used for chewing. Certain grades of Maryland are used for cigarette manufacture and about 40 per cent. of this type is exported to Europe.

TOBACCO FARMS.

The size of farms, methods employed, and the crops grown on tobacco farms vary considerably in individual districts, and more so between one section of the country and another where different types of tobacco are grown. Consequently it is difficult to summarise briefly the position and give an accurate picture of the situation.

In the Southern States mules are used entirely in place of horses for farm work although they are relatively expensive. It is said that they stand the hot weather better than horses, do well on poor feed, and require less to keep in good condition. They are particularly well adapted for row cultivated crops, such as tobacco, cotton, and corn, as they have small feet and do not take fright easily and consequently are not so apt to damage the crop. Furthermore, they are more easily handled and so better adapted for negro labour. Mules are mostly bred on the rich grass country of Kentucky and Tennessee and are sent from there to the other tobacco-growing States. Horses are used in Maryland and in the more northern States where tobacco is grown.

Most of the manual work is done by negros in the south. Women and children assist with some work, such as plant-setting, harvesting, and grading. Rates of wages vary somewhat and have been reduced considerably since the depression. At the Oxford Experiment Station adults were being paid from 12 to 15 cents per hour and children about 5 cents per hour. As a general rule coloured labour was worth about 75 cents a day with keep. For special work a dollar a day or $25 a month might be paid. At the present rate of exchange a dollar or 100 cents is worth about 5s.

In the flue-cured districts much of the tobacco is produced on a "share cropping" system, some on relatively small individual farms and a little on large estates. These three methods were observed in South Carolina and for conciseness actual cases will be discussed.

One landlord with 400 acres indicated that he had half a dozen tenant farmers on the property, some of whom were negros and others were white. Usually the landlord would supply the land, fertilizer, and rations, and would halve the returns from the cash crops. Incidentally since corn is not considered a cash crop, tenants endeavour to get as much land as possible for corn. In other cases the land would be merely rented to the tenant for cash. At the present time rentals are about six dollars per acre, but in the past they have been as high as twenty dollars. The capacity of a farm is usually referred to in terms of so many ploughs, horses, or mules, all of which are synonymous terms. Some tenant farms would be "one-horse farms" and others "two-horse farms." A typical "one-horse farm" would comprise about 20 or 30 acres and would have about 5 acres under tobacco, 12 acres under cotton, 3 acres of oats, and 8 to 10 acres of corn. There would also be a garden plot and some cows and pigs. A "two-horse farm" would, of course, be about twice that size.

The small privately-owned farm is well exemplified in Horry County. This county incidentally is the most important for tobacco production in that State and sells about 24,000,000 lb. annually. The growers are a distinct type of intelligent farmers who specialise in intensive tobacco production. Unlike other counties very little cotton is grown in this section, and tobacco is practically the only cash crop. The farms are relatively small with about 8 or 10 acres planted to tobacco. Most of the work is done by the farmers' families in contrast with other sections which depend largely on negro labour. Farms similar to those of this county are also found to some extent scattered throughout other tobacco-growing areas.

Tobacco is also grown on large farms or plantations. One which was inspected had 60 acres of tobacco planted. The negro labourers were paid wages and given homes and fuel on the plantation. The men were given from 50 cents to a dollar a day according to the work and their ability, and women about 50 cents a day. They usually worked for five and a-half days in the week. In good seasons a bonus of 10 per cent. or 20 per cent. was also given. On other plantations conditions would possibly not be so generous. The management of this property was exceptionally good and the value of efficient cultural methods was appreciated.

In North Carolina a "one-horse farm" was considered to consist of about 5 acres of tobacco, 5 to 10 acres of cotton, and 4 or 5 acres of corn under cultivation. In the eastern portion of the State "three-horse farms" were the general rule, whereas "two-horse farms" were more common in the western part of North Carolina. In the latter case there would be rarely any cotton grown. About 30 per cent. of the farm would be cultivated and this would consist of some 8 or 10 acres of tobacco, the same amount of corn, and usually some wheat.

Tobacco farms in Georgia are very similar to those of South Carolina. Tenant farms are mostly of the "one-horse" type, and sharecroppers would plant from 2 to 7 acres of tobacco.

In Virginia tobacco is practically the only cash crop. Properties would vary from 100 to 700 acres and would generally be divided up into "two-horse" tenant farms. There is considerable variation in the size of tobacco crops, which would be anything from 1 to 15 acres in area.

In Tennessee, where Burley tobacco is extensively grown, tobacco is also the main cash crop. Usually 1 or 2 acres would be under tobacco and in rare cases it might be as much as 15 acres. A typical farm would possibly contain 2 acres of tobacco, 20 acres of corn, 10 acres of wheat, 25 acres of pastures, and 15 acres for hay, which might be of cowpeas, clover, or lespedeza. There would also be four or five cows and some pigs and poultry.

Cigar binder tobacco in Wisconsin is usually grown as a side line on small dairy farms. Individual areas under tobacco would vary from 2 to 20 acres.

In Pennsylvania cigar filler and cigar binder tobaccos are grown in association with a steer-fattening industry and to some extent dairying. Generally a rotational plan which might involve wheat, clover, lucerne, corn, or pastures is practised with the cultivation of cigar filler tobacco, whereas cigar binder tobacco is usually grown on the same land continuously. This type of farming is intensive. Hay, corn, and straw are fed to the cattle and the fertility of the soil is maintained with heavy applications of manure.

Shade grown cigar wrapper tobacco is produced in Florida and in the Connecticut Valley, and is mainly in the hands of large companies. The American-Sumatrin Company alone plants more than half of the total acreage under this tobacco type in Florida. This type of farming is naturally very specialised and very extensive. Seed-beds for such plantations are at times acres in extent.

FLUE-CURED TOBACCO.

Flue-cured tobacco represents more than half the total acreage under tobacco in the United States and is the most important class grown. The production of modern flue-cured tobacco gradually evolved from the type of tobacco culture practised by the early Virginian colonists. Eventually tobacco growing spread westward onto lighter sandy soils and the method of curing was modified. Virginian tobacco was at first cured over open wooden fires which were later superseded by charcoal fires. It was not until about the time of the Civil War that pipes or flues were used as a means of heating the barns. They were at first made of rock and ran straight through the curing barn. Later sheet iron and a more elaborate plan of flues was introduced. The first tobacco cured in this fashion was grown in the Granville and Caswell counties of North Carolina about 1867 to 1869, and the method was generally adopted shortly afterwards. Consequently Virginian tobacco, which is now a trade name to describe this class irrespective of where it is grown, became milder and lighter in colour and lost the smoky flavour characteristic of the early colonial tobacco. The demand for a light type of tobacco was at first the result of an expansion of the chewing tobacco trade. This demand was greatly intensified with the development of the cigarette industry.

There was a rapid development in the production of flue-cured tobacco from about 1890, and its cultivation spread into eastern North Carolina and into South Carolina. More recently the flue-cured belt has been extended in to Georgia and northern Florida. Production increased greatly subsequent to the war and in 1930 there were 864,276,000 lb. of this type produced, and over 1,000,000 acres under crop. During the past few years, in an effort to increase crop values, production has been reduced and controlled by the Agricultural Adjustment Administration, and in 1933 about 700,000,000 lb. were produced.

Bright flue-cured tobacco is used largely in the manufacture of cigarettes, smoking and plug tobacco. Its quality and characteristics are influenced by climatic conditions and the soil on which it is grown. Consequently flue-cured tobacco is divided into several types by the United States Department of Agriculture. U.S. Type 11 is produced in the Old Belt, which is the hilly Piedmont section of Virginia and western North Carolina. Three other types are grown in the New Belt, which embraces the sandy flat area known as the Coastal Plain. Of these U.S. Type 12 is produced mainly in eastern North Carolina, U.S. Type 13 is produced in eastern South Carolina, and finally U.S. Type 14 is grown in southern Georgia and northern Florida. Generally speaking, the leaf of the Old Belt is of poorer colour than that of the New Belt, but has better aroma, body, and texture.

The production of bright flue-cured tobacco in the United States may be approximately represented as being produced by the various States as follows:—North Carolina 71 per cent., Virginia 10 per cent., South Carolina 10 per cent., Georgia 8 per cent., and Florida 1 per cent. The further production of this crop in America is only limited by its market value, and if the demand arose, a tremendous area of suitable country there could be used for tobacco culture. It is interesting to note that at a conference of tobacco specialists held in Virginia last year it was estimated that production could be increased in various States if desired, by approximately the following amounts:—North Carolina 70 per cent., Virginia 85 per cent., Georgia 85 per cent., and South Carolina 90 per cent., and that "States now producing no bright tobacco could grow an amount equal to the present world consumption."

FLUE-CURED TOBACCO SOILS.

The soils used for the production of flue-cured tobacco may be roughly divided into two groups—namely those of the Old Belt or Piedmont, and the New Belt or Coastal Plain respectively. The former are predominantly loams and sandy loam soils derived from the underlying granite, gneiss, and slate, &c., and usually have a heavy clay subsoil. The latter group are sedimentary soils of marine origin and are more sandy and gravelly. Typical tobacco soils have been described (U.S.D.A. Farmers' Bulletin No. 571) as being "light sands and sandy loams with yellow or red sandy and sandy loam subsoils containing relatively small proportions of clay, except in the Piedmont region, where the subsoil is distinctly clayey." Furthermore, these soils are generally of low fertility.

In the Old Belt tobacco is actually grown on a tremendous variation of soil types although some are not very desirable. In North Carolina there are thirty-six soils officially listed as more or less suitable for tobacco production. In a relatively small area many distinct types may be readily observed, the surface of which varies from sand to pipe clay and the colour from white to various shades of black or red. Since tobacco can apparently be grown profitably in some cases on such a remarkable variation of soil types, it would appear that possibly soil type alone is not such an important factor as might be assumed contributing to the outstanding qualities of American tobacco.

In the New Belt there is not the same degree of variation in tobacco soils. They are mostly light sandy loams varying in depth from about 16 inches to several feet. One of the most desirable types is a fine soft sandy loam, grey on the surface with a bright yellow subsoil. The underlying subsoil, which is found at 18 inches to 3 feet, is a bright yellow sandy clay with a rather crumbly texture. Good tobacco soils should be well drained but they all have a definite clay subsoil. Deep sands are not desirabe as they do not adequately retain moisture, and the nitrogenous portion of the soil solution, particularly, is apt to be leached out. Such soils can only be expected to give satisfactory results in ideal seasons. Depth and physical characteristics are considered of much greater importance for tobacco culture than the chemial analysis of soils.

Soils in the United States have been extensively surveyed and specific types have been given distinctive names. It is considered that the best soils for bright tobacco in the various States, listed in order of preference, are as follows:—

North Carolina—Piedmont Area: (1) Granville; (2) Durham; (3) Appling; (4) Cecil sandy loam. Coastal Plain Area: (1) Norfolk, (2) Marlboro.

Virginia:—(1) Granville; (2) Durham; (3) Norfolk; (4) Appling; (5) Cecil sandy loam.

Georgia:—(1) Norfolk loamy sand; (2) Tifton, light phase.

South Carolina:—(1) Marlboro; (2) Portsmouth; (3) Dunbar; (4) Norfolk.

The mechanical and chemical characteristics of some typical North Carolina tobacco soils are indicated in Tables II. and III. This data is from "The Bulletin" of the North Carolina Department of Agriculture of January, 1933.

TABLE II.

AVERAGE MECHANICAL ANALYSES OF THE SURFACE SOIL OF TYPICAL FLUE-CURED TOBACCO SOILS.

Soil Series and Type.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
	%	%	%	%	%	%	%
Granville coarse sandy loam	15·3	23·9	10·4	14·3	8·1	19·2	8·0
Durham coarse sandy loam ..	12·9	18·1	12·4	23·2	8·2	19·2	5·8
Cecil sandy loam	5·3	16·7	10·2	24·2	11·2	23·6	8·5
Norfolk sandy loam	2·5	17·3	15·4	19·0	6·3	29·5	9·8

TABLE III.

AVERAGE OF TOTAL PLANT FOOD CONSTITUENTS PER ACRE FOR 6⅔ INCHES OF SURFACE SOIL OF THE FOUR MAJOR BRIGHT TOBACCO SOIL SERIES.

Soil Series.	Nitrogen.	P_2O_5.	K_2O.	CaO.	MgO.
	Lb.	Lb.	Lb.	Lb.	Lb.
Granville	625	899	15,499	2,444	6,558
Durham	635	802	13,281	7,706	1,618
Cecil sandy loam	770	546	45,036	3,100	5,459
Norfolk	618	529	7,717	5,317	1,800

Most tobacco soils have an acid reaction, and those with a range of pH 5·00 to 5·25 are recommended for tobacco culture. Excellent crops have been observed growing on soils with a reaction as low as pH 3·96.

The Coastal Plain, on which the greatest part of the flue-cured tobacco is grown, is mostly very flat low-lying country. Numerous and extensive swamps are typical of this portion of the United States.

Consequently, drainage is an important factor in tobacco growing in this area. Open drainage ditches from 3 to 6 feet deep are frequently constructed around the boundaries of fields for this purpose (Plate 172). Care has to be taken not to have them too deep as there is the danger of unduly lowering the water table.

PLATE 172.
OPEN DRAINAGE DITCHES.

A drainage ditch running across a newly planted field of tobacco in South Carolina. Another drain borders the road, which passes over the bridge in the middle foreground.

CLIMATIC CONDITIONS IN THE FLUE-CURED BELT.

Climatic conditions have a considerable influence on the quality of tobacco irrespective of the nature of the soil on which it is grown. As a broad generalisation it would seem that about 4 to 6 inches of rain each month during the growing season is desirable. Heavy rain may be very detrimental particularly towards the end of the season, and best results are obtained when it is distributed in showers of about half an inch. For regular and vigorous growth warm weather day and night, with a range of about 65°F. to 90°F., is necessary when the plants are in the field.

Table IV. gives climatic data for four representative counties in the flue-cured belt. Horry County is near the coast and has a somewhat higher rainfall than most sections of the tobacco-growing area, but it is the most important county in South Carolina for tobacco. Florence County is fairly typical of the rest of the State, and Lenoir County is also on the Coastal Plain and represents the New Belt of North Carolina. It will be noted that these three counties have a first peak of monthly rainfall in February and a second and major peak in July and August. Durham County is representative of the Old Belt. It has a somewhat lower rainfall with a single peak in August, and the temperatures are lower than the more southern and eastern counties.

TABLE IV.

Meteorological Data.

TYPICAL FLUE-CURED TOBACCO AREAS IN THE UNITED STATES.

—	—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Horry County, S.C. (Conway) ..	Precipitation (ins.)— ..	3·59	4·12	3·54	3·07	3·66	5·27	6·6	6·61	5·07	3·17	2·26	3·34	50·31
	Temperature (°F)—													
	Maximum	59·5	60·4	68·2	75·3	82·4	87·7	89·8	89·0	85·2	76·7	67·3	59·4	75·1
	Minimum	36·6	37·6	45·1	50·7	59·0	66·8	70·3	69·9	65·2	53·5	42·1	36·8	52·8
	Average	48·2	49·1	56·5	63·1	70·7	77·1	79·9	79·3	75·0	64·9	54·6	48·4	63·9
Florence County, S.C. (Florence) ..	Precipitation (ins.) ..	3·04	4·11	3·34	3·00	3·96	5·46	5·84	5·19	4·31	3·00	2·05	3·06	46·36
	Temperature (°F.)—													
	Maximum	56·4	58·0	68·2	75·0	84·2	90·0	92·0	90·9	86·7	76·8	66·8	56·8	75·2
	Minimum	35·2	36·2	43·6	50·0	59·6	66·9	70·4	69·5	64·2	52·4	41·5	35·3	52·1
	Average	45·6	47·2	55·7	62·9	72·0	78·6	81·3	80·2	75·2	64·1	54·1	45·8	63·6
Lenoir County, N.C. (Kinston) ..	Precipitation (ins.) ..	3·57	4·00	3·82	3·08	3·81	5·54	6·61	5·43	4·92	2·64	2·23	3·19	48·84
	Temperature (°F.)—													
	Maximum	57·0	57·9	66·6	74·6	83·5	88·5	91·0	90·6	85·7	75·6	64·9	56·6	74·4
	Minimum	34·1	34·2	41·4	48·0	57·6	65·0	69·2	68·2	63·3	50·8	39·8	34·2	50·5
	Average	45·2	45·9	53·5	60·9	70·4	76·7	80·1	79·5	74·4	63·3	51·7	45·0	62·2
Durham County, N.C. (Durham) ..	Precipitation (ins.) ..	3·31	3·02	3·69	3·34	3·32	4·15	4·47	4·72	3·13	2·84	2·06	3·16	41·21
	Temperature (°F.)—													
	Maximum	50·4	54·8	61·4	71·1	78·6	86·2	89·4	87·7	84·0	72·3	60·3	52·1	70·7
	Minimum	28·8	32·3	36·7	45·3	53·9	63·4	67·5	65·1	61·5	46·9	37·8	31·4	47·5
	Average	39·6	43·5	49·1	58·1	66·2	74·9	78·4	76·4	72·6	59·6	49·0	41·6	59·1

It will be observed that the rainfall is well distributed throughout the year, which incidentally lessens the difficulty of growing winter crops for rotational purposes. Winter temperatures however are low, the lowest average monthly minimum for the areas under discussion being Durham with 28·8°F. for January. This is advantageous with tobacco culture since it effectively prevents the growing of the crop out of season and tends to control pests and diseases. The higher rainfall in the summer months is more or less offset by the greater plant transpiration during the higher temperatures at that season of the year, and consequently the "precipitation efficiency" is much the same throughout the year.

The tobacco season extends approximately between April and August on the Coastal Plain and about a month later on the Piedmont, and is shown by heavy lines in the table. It will be noted that the rainfall is about 4 inches a month with high average temperatures. Actually the climate is very oppressive during the summer owing to the high relative humidity and warm nights.

For comparison, meteorological data is given for some Queensland tobacco areas. (Table V.) In some cases temperature records are not available. Those for Goondiwindi are given as being more or less representative of the south-western portion of the State. It will be noted in contrast to the United States that there is a very definite dry season during the winter which becomes more pronounced on progressing from south to north. It is most marked at Mareeba, where each of six months in the year has an average of less than an inch of precipitation. Consequently the average annual rainfall is apt to be misleading. The tobacco growing season in Queensland is not, as yet, very well defined, but for comparative purposes is taken as approximately the five months subsequent to the commencement of the wet season in December. Obviously from the table it can be noted that in most cases the average monthly rainfall is much greater in Queensland than in the United States during the growing season. These high rainfalls would be considered excessive under American conditions. The opinion was expressed in the United States that the 1929 season was excessively wet at Oxford, North Carolina, and the tobacco suffered in consequence. The actual registrations for that season were as follows:—May 4·54 inches, June 5·64 inches, July 6·58 inches, August 7·98 inches, September 2·58 inches. The average monthly rainfall recorded for most of the Queensland areas during the growing season are higher than these figures.

In analysing meteorological data it must be borne in mind, however, that average figures are frequently misleading since they do not give a picture of the fluctuations which occur in practice. Variations in soil type and drainage must also be considered. American tobacco areas probably differ most from those in Australia in having greater regularity of both temperature and precipitation and less rainfall during the growing period. In a recent publication from the Duke University ("Flue-cured Tobacco—Factors Determining Type and Seasonal Differences," by F. R. Darkis, L. F. Dixon, and P. M. Gross), analyses of tobacco leaf have been well correlated with climatic data to illustrate the effect of rainfall on tobacco quality and leaf character. It is claimed that excess rainfall results in thin, light-bodied leaf, with increased carbohydrate and lowered nicotine, petroleum ether extract, and total nitrogen determinations. Deficient rainfall on the other hand gives a thick, hard, gummy, dark coloured tobacco, which on analysis is found to have a

TABLE V.

Meteorological Data.

QUEENSLAND TOBACCO-GROWING AREAS.

—	—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Texas	Precipitation (ins.)	3·32	2·58	2·27	1·15	1·59	1·93	1·84	1·39	1·62	2·10	2·33	3·10	25·62
Goondiwindi	Temperature (°F.)— Maximum	91·3	92·0	87·6	80·8	72·3	65·8	64·4	68·7	76·2	83·2	89·1	92·3	80·5
	Minimum	66·8	66·3	62·5	54·7	47·3	43·5	40·8	42·2	48·5	55·4	61·8	65·4	54·6
Rockhampton	Precipitation (ins.)	7·85	7·89	4·55	2·62	1·63	2·64	1·50	0·85	1·36	1·75	2·32	4·79	39·75
	Temperature (°F.)— Maximum	89·3	88·6	87·2	84·3	79·5	74·6	74·2	77·2	81·7	86·1	88·5	90·3	83·5
	Minimum	71·8	71·7	69·6	64·8	57·5	53·9	50·7	52·6	58·4	63·7	67·6	70·9	62·8
Mackay	Precipitation (ins.)	14·49	11·47	12·27	6·56	3·74	2·68	1·63	1·06	1·59	1·70	2·91	7·24	67·34
	Temperature (°F.)— Maximum	85·9	85·3	83·7	80·7	76·2	72·6	71·4	73·1	77·1	81·3	84·1	86·1	79·8
	Minimum	73·3	72·9	70·9	66·4	60·0	56·0	52·7	54·4	59·5	65·1	69·1	72·1	64·4
Bowen	Precipitation (ins.)	10·37	8·84	5·76	2·83	1·32	1·64	0·91	0·66	0·83	1·05	1·27	4·40	39·88
	Temperature (°F.)— Maximum	87·8	87·5	86·4	83·9	79·7	76·2	75·2	77·1	80·5	83·7	85·8	87·8	82·6
	Minimum	79·1	74·5	73·1	69·5	63·3	59·3	56·5	58·5	63·0	68·4	71·7	73·9	67·6
Townsville	Precipitation (ins.)	11·4	11·4	7·45	3·48	1·31	1·32	0·62	0·51	0·83	1·37	1·76	5·45	46·9
	Temperature (°F.)— Maximum	86·9	87·0	86·2	84·1	80·4	76·6	75·5	76·8	79·7	82·5	84·5	86·3	82·2
	Minimum	75·8	74·9	73·4	69·6	64·2	60·8	58·4	60·4	65·3	70·5	73·5	75·6	68·5
Miriam Vale	Precipitation (ins.)	10·03	8·40	4·97	3·26	2·05	2·82	1·77	1·23	1·56	2·43	2·85	5·86	47·23
Mareeba	Precipitation (ins.)	9·48	7·37	6·97	2·72	0·66	0·50	0·31	0·21	0·20	0·61	1·40	4·49	34·86

decreased sugar content, and an increase in nicotine, petroleum ether extract, total nitrogen, and a greater percentage of total soluble nitrogen. When heavy rain occurs after a dry period tobacco makes second growth which is apt to be poor in texture, colour, and smoking quality. The analysis of such tobacco is rather similar to that of tobacco grown under deficient rainfall conditions except that there is a greatly increased amount of amino nitrogen, which is indicative of immaturity.

In reviewing the analyses of typical tobacco from various parts of the flue-cured belt the same general correlation between rainfall and quality are observable, and chemical composition associated with leaf character, as discussed above, also obtains. For instance, on the Coastal Plain where the rainfall is relatively high, the tobacco tends to be light bodied, thin, and with a very yellow colour. Conversely, on the Piedmont with less rainfall, the tobacco is thicker, gummier, heavier bodied, darker coloured, and is more aromatic with fuller smoking quality. On analysis the leaf of the latter is found to contain more total and soluble nitrogen, non-volatile acids, nicotine and petroleum ether extract, and less sugar content than leaf from the Coastal Plain.

ROTATIONS.

Throughout the Coastal Plain section the most general practice is to either grow tobacco continuously on the same land or else to alternate cotton with tobacco culture. In the hilly Piedmont section, however, the danger of losses through erosion necessitates the use of at least a cover crop during the winter. In other sections the presence of soil-borne diseases also makes the practice of crop rotation a necessity. Rotations, however, are also adopted by the more progressive farmers with the object of improving quality and increasing returns.

The best quality tobacco leaf is produced on virgin land or on land which has been "rested" or permitted to grow weeds for one or two years. The fact that no cultivated crop gives such satisfactory results as a weed fallow in rotation with tobacco has lead to an intensive investigation (Plate 173) as to the effect of certain weeds on the subsequent growth of tobacco. Already it has been demonstrated that certain specific weeds, such as horseweed (*Erigeron Canadensis*) and ragweed (*Ambrosia artemisiifolia*), are much more satisfactory than others to precede tobacco, and that some, such as lamb's quarter (*Chenopodium album*), known also as fat-hen in Australia, are detrimental (Plate 174).

The practical value of a weed fallow is being appreciated in the United States and is being generally applied by the most progressive farmers. Some of the best-quality leaf is now being produced after weeds (Plate 175).

In portions of the Old Belt, the presence of Granville Wilt, a serious soil-borne disease, makes a continuous tobacco culture, or the use of a weed rotation, impossible, since certain weeds are also host plants of this disease. In such areas long rotations are recommended, making use of such plants as grains, clovers, cowpeas, and soy beans, which are apparently immune to it.

Probably the most usual practice in the Old Belt is to grow a grain crop, such as wheat or rye, after tobacco (Plate 176). At times red top grass (*Agrostis alba*) is sown with the grain. The grain is harvested

PLATE 173.

WEED ROTATION EXPERIMENTS.

A crop of horseweed (*Erigeron Canadensis*) in a tobacco rotation experimental plot at the Pittsylvania Experimental Station, Virginia.

PLATE 174.

THE EFFECT OF WEEDS ON THE SUBSEQUENT GROWTH OF TOBACCO.

Young tobacco growing after pure cultures of weeds at the Pee Dee Experiment Station, South Carolina. The poor stand of tobacco in the foreground was planted after lambs-quarter (*Chenopodium album*). The plot to the right was planted after ragweed (*Ambrosia artemisiifolia*) the previous season.

PLATE 175.

THE PRACTICAL APPLICATION OF WEED FALLOW.

A tobacco field which has been "rested" for a season in order to grow a crop of horse-weed (*Erigeron Canadensis*). The most successful farmers find a weed rotation prior to a tobacco crop a profitable procedure.

PLATE 176.

HARVESTING A WHEAT CROP IN THE FLUE-CURED BELT.

Wheat being grown as a rotational crop for tobacco.

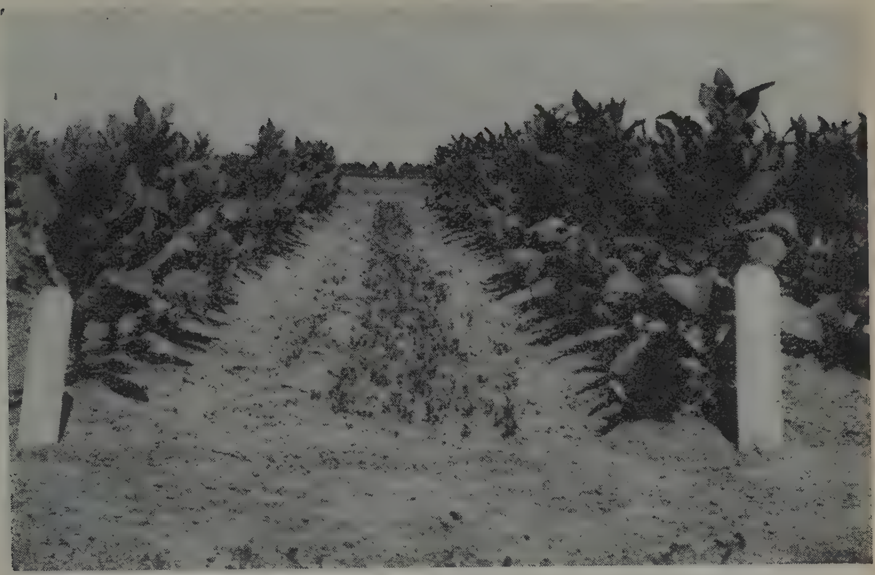


Plate 177.

Tobacco Rotation Experiments.

Tobacco rotation plots at the Coastal Plain Experiment Station, Georgia. On the right a four-year rotation where tobacco was grown after cotton, corn, and velvet beans, and Spanish peanuts. On left tobacco after a crop of mixed weeds.

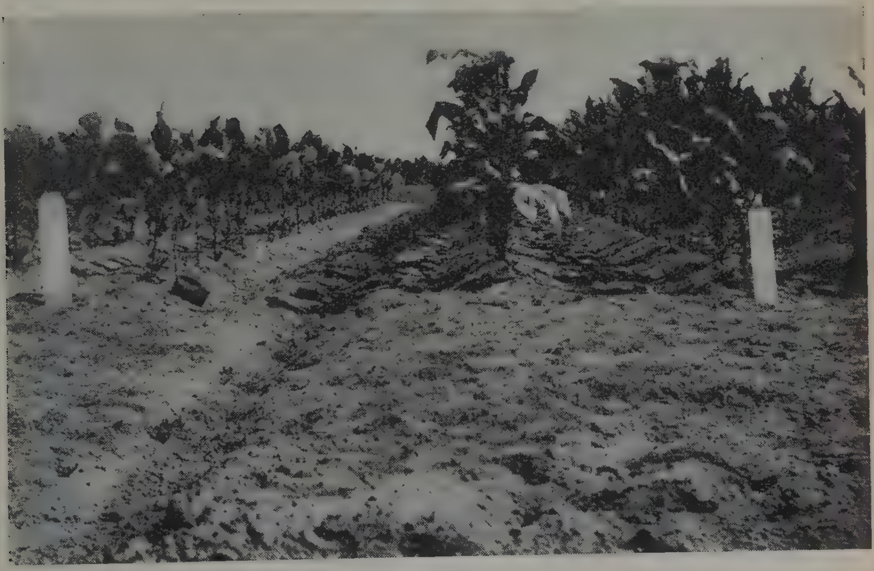


Plate 178.

Tobacco after Crotalaria.

Plot on left shows tobacco grown continuously on the same land. That on the right illustrates the increased growth of tobacco following oats and Crotalaria. Nematodes were not as severe as usual in 1935. In a more normal season the contrast possibly would have been greater.

in the spring and the grass ploughed under the following autumn or early winter, or the land may be left in sod for a couple of years, particularly where wilt is a problem. Numerous rotations are advocated for this area, but since the land should not be in too rich a condition for tobacco, one underlying principle is that where a legume is used it should follow the tobacco crop and not precede it.

Loss through nematode infestation is becoming an increasingly serious problem on the light soils of the Coastal Plain. Consequently efforts are being made, particularly in Georgia, to control this pest by crop rotation. Possibly the best results are being obtained at the Coastal Plain Experiment Station with a four-year rotation which includes cotton, corn interplanted with velvet beans, Spanish peanuts, and tobacco (Plate 177).

The best quality tobacco is apparently obtained in these experiments where the land is used for oats followed by weeds during the two seasons preceding tobacco. However, the most promising results in nematode control were obtained by maintaining a bare fallow for two years preceding tobacco. Another very satisfactory rotation consists of following peanuts by oats. Weeds are permitted to follow the oats through the succeeding summer and are turned under in the autumn to be followed by tobacco in the spring. It was only at this experiment station that Crotalarias were observed in tobacco rotational experiments. *Crotalaria retusa* is being found more satisfactory than *C. spectabilis,* since the latter usually makes too rank a growth. Satisfactory growth and good-quality leaf has been produced after Crotalaria and after Crotalaria and oats (Plate 178). Rotations for the control of nematodes are further discussed under the "Root-Knot" section of this report.

SEED BEDS.

In the flue-cured tobacco areas seed beds are generally roughly square-shaped structures. They vary considerably in area and may be quite extensive. Frequently each side is about 40 or 50 feet long. The soil is rarely sterilised. The usual practice is to cut out a space in the woods (Plate 179) each year for a seed-bed site and so tend to obviate weed growth and trouble from disease. Where old beds are used they may be burnt over prior to seeding. The beds are covered with cheese cloth supported by wires attached to logs, which form the borders of the beds, or at times by bent twigs dug into the bed.

Where there is danger of frost injury straw is frequently piled over the beds in cold weather and breakwinds may be constructed. A ditch is usually dug around the beds to permit drainage (Plate 180).

Mixed fertilizers are frequently applied in relatively large quantities. Consequently chlorine damage to the young plants is not rare. It is now officially recommended in the United States that such fertilizers should be practically free of chlorides and contain 8 per cent. phosphoric acid, 4 per cent. nitrogen, and 3 per cent. potash. Fertilizers are applied at the rate of about 2 or 3 lb. per square yard of bed.

Seed may be mixed thoroughly with wood ashes, cotton seed meal, fertilizer or soil, and carefully applied in two or four directions over the bed and then firmed into the soil. The rate of seeding is about ¼ oz. to ½ oz. of seed for each 100 square yards of bed.

PLATE 179.
SEED BEDS.

A tobacco seed-bed in the woods in South Carolina with the "canvas" or cheese cloth covering in place.

PLATE 180.
TOBACCO SEED BEDS.

A seed-bed in Georgia with the cheese cloth covering removed, showing pegs and wires for the support of cover and drainage ditch around bed.

FLUE-CURED TOBACCO VARIETIES.

As might be expected, a great number of varieties of flue-cured tobacco are grown in the United States. Only some half dozen, however, are grown extensively and are apparently of outstanding merit. North Carolina produces about 75 per cent. of the flue-cured crop, and it has been estimated that 85 per cent. of the tobacco grown there consists of five varieties. They are Cash, White Stem Orinoco, Jamaica Wrapper (including Gold Dollar), Bonanza, and Virginia Bright Leaf.

PLATE 181.

SELECTING TOBACCO PLANTS FOR BAGGING.

When the seed-head has completely elongated, flowers which have opened are pinched out, sucker seed branches are removed, and a brown paper bag is tied over the flower head.

Possibly the most serious attempt in recent years to improve flue-cured tobacco varieties has been made by the Coker Seed Company in South Carolina. Their plant breeders made a careful study of the most promising commercial varieties and made selections from them. Gold Dollar was a selection made in this manner from Jamaica Wrapper. Its excellence is illustrated by the fact that although it has only been distributed since 1929, it is considered that about 80 per cent. of the tobacco now grown in South Carolina consists entirely of this variety. Other varieties grown in that State are Yellow Mammoth, Jamaica Wrapper, Hickory Pryor, Willow Leaf, Cash, and White Stem Orinoco.

In Virginia the two most promising varieties are apparently Jamaica Wrapper and Yellow Mammoth, and in Georgia Gold Dollar and Bonanza are most favoured.

Taking the flue-cured belt generally, it would seem that there has been a tendency to replace varieties such as Warne, Adcock, and Gold Leaf, which have been found in the United States to produce a heavy-bodied, dark-coloured leaf, by a group of a lighter type. The relative popularity of the latter varieties may possibly be placed in the following order:—Jamaica Wrapper (including Gold Dollar), Yellow Mammoth, Cash, and Bonanza.

Plate 182.

Bagged Flower Heads.

Selected tobacco plants at the Coker Seed Company, South Carolina, which have been bagged for seed production.

SEED PRODUCTION.

Some individual growers bag the flower-heads of their most promising plants in the field and save the seed so selected each year. The bags should be placed in position when the seed-head has completely elongated (Plate 181). Others purchase their seed from growers who specialise in seed production or from seed companies.

In North Carolina a method of seed certification is in force. Certain farms are selected for the production of the more important tobacco varieties by the staff of the local experiment station. During the growing season the crops are inspected by officers of the United States Department of Agriculture, and if the tobacco is found to be free of disease, true to type, and otherwise satisfactory, a certificate to that effect is issued to the grower. Officially certified seed brings a good price, and consequently seed growers make a conscientious effort to produce seed which will eventually be certified.

The methods adopted by the Coker Seed Company, which is one of the largest seed producing concerns in the United States, were observed in South Carolina. Their procedure is as follows:—The seed from each selected bagged head is collected and planted the following season in two rows. Plants in one row are topped and receive the usual cultural treatment. The middle leaves of these plants are cured and tested for quality. The best plant or plants in the other row are further selected for desirable field characters and the flower-heads of selected plants are bagged (Plate 182). Should it be decided to propagate commercially from these selected plants, their progeny are set out in isolated fields, usually in duplicate. These fields are situated at least half a mile from any other variety. The flower-heads are not bagged (Plate 183), and the top leaves are not stripped, and inter-pollination within the plant family is considered advisable. Off-type plants, which consist of about 10 per cent. of the crop, are topped and sucker seed stalks are cut off. Most of the lower leaves are primed and cured as they mature.

PLATE 183.
COMMERCIAL PROPAGATION OF TOBACCO SEED.

An isolated field of tobacco grown for seed production. Off type plants, which usually consist of about 10 per cent. of the total, are topped and sucker seed stalks are cut off.

The seed is harvested when ripe, thoroughly cleaned three times in an air machine, disinfected with formalin, and carefully washed in water.

Where seed-heads are bagged, it is a general practice to periodically examine them and to apply a little lead arsenate powder to protect the seed-heads from bud-worm damage (Plate 184).

PLATE 184.

PROTECTING SEED-HEADS FROM INSECT INJURY.

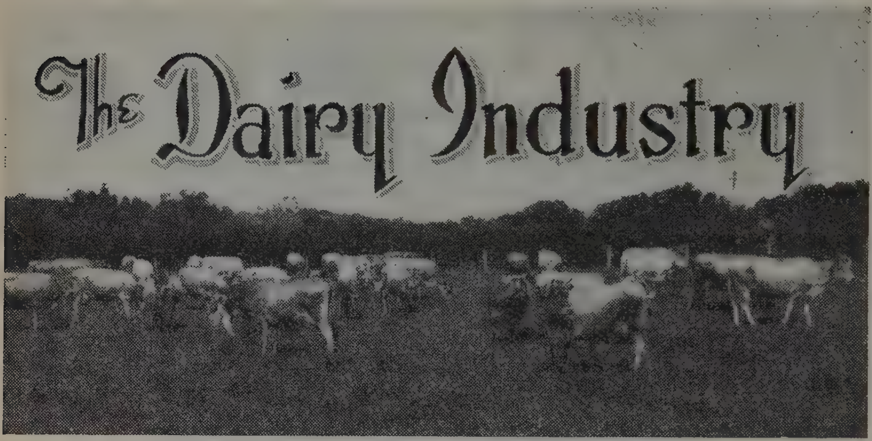
Examining cigar tobacco seed-heads in Florida. Note the cloth bag attached to workman's belt for holding lead arsenate, a little of which is sprinkled over the seed-capsules to control bud-worms.

LONGEVITY OF SEED.

In most parts of the United States tobacco seed will germinate fairly well after at least five years of storage. It has been found in Florida, however, that it apparently deteriorates very rapidly and will not germinate satisfactorily if more than two years old. Since the latitude and weather conditions of Florida more closely approximate those of Queensland than do other localities in the United States, it is possible that seed germination may be similarly affected here.

It is apparently inadvisable to store tobacco seed in air-tight containers, and the usual practice is to keep seed in cloth bags.

[TO BE CONTINUED.]



CURDY AND JUNKETY MILK AND CREAM.

E. B. RICE, Dairy Research Laboratory.

SWEET CURDLING OF MILK.

SINCE the establishment of the Dairy Research Laboratory, a number of milk vendors in the Brisbane district have called to seek advice concerning a defect which manifests itself by a curdling of the milk without the usual souring in taste. This condition, referred to as the sweet curdling fermentation, presents a serious problem to the vendor, for the rapid thickening renders the milk unsaleable, or if it be supplied to householders before that stage is reached complaints about the spoilage in the home ensue with consequent loss of custom.

Sweet curdling is a bacterial defect, the organisms causing the coagulation through the production of an enzyme known as rennet. Enzymes, which are present in all living cells, possess the power of bringing about chemical changes of great magnitude in comparison with the quantitiy of enzyme involved; for example, one part of rennet is able to curdle in a few minutes several million parts of milk. The bacteria capable of secreting rennet are mostly species whose natural habitat is the soil. By reason of the susceptibility of milk to soil contamination soil organisms of various species are of frequent occurrence in dairy products.

Milk affected in this manner is of seasonal occurrence, its incidence being more prevalent in warm weather on account of the most favourable temperature for the growth of the causal organisms being in the vicinity of 80° F. Inquiry almost invariably elicits the information that in dairies troubled with this defect cooling of the milk is not attempted.

Causative Organisms.

1. *Aerobic spore-producing bacteria.*—These bacteria of typically soil forms are very commonly found in milk products. They are often responsible for the sweet curdling of pasteurised milk owing to the spores resisting the heating to which the milk has been subjected, but are only occasionally found in large numbers in samples of raw milk showing the fermentation.

2. *Non-spore-forming rods.*—Among these are the Proteus group of bacteria which are always present on decaying material. They are not troublesome under ordinary conditions, being overgrown by other species.

3. *Micrococcus species.*—These bacteria are the most important causal agents connected with this defect and microscopical and cultural tests generally reveal their presence in large numbers in samples of sweet curdled milk which arrive at the laboratory.

Recommendations for Control.

1. Keep cows clean, regularly brushed, and wash the udders and teats before milking with a clean, recently boiled cloth and a weak solution of potassium permanganate or a chlorine preparation.
2. The milker's hands should be washed before milking each cow.
3. Avoid contamination of the milk by dust in the bails and dairy.
4. Cool milk to below 60° F. as soon as possible after production and maintain in a cool condition until delivery.

JUNKETY CREAM.

A defect of cream of somewhat infrequent occurrence closely resembling the sweet curdling of milk is that described colloquially by farmers and factory employees as "junkety" cream. It seems to make its appearance in epidemic form and at such times the cream from many suppliers in a district will be affected.

The abnormal condition is caused by micrococcus species which secrete rennet and can be induced in fresh cream by adding to it a small portion of affected cream, or, in the laboratory, by inoculating the organisms into sterile milk and cream.

Control.

Contamination appears to take place in the separator and utensils and strict attention to cleanliness becomes an important factor in its elimination. Cooling of the cream will also keep the organisms in check, as their growth is much slower at temperatures below 70° F.

THE CURDLING OF SOUR MILK AND CREAM.

The sour taste acquired by milk which is held for any length of time at ordinary temperatures is familiar to everyone. The curdling which follows this normal souring is due to the acid produced by bacterial growth in the milk resulting in an alteration of the state of the casein. In fresh milk the casein is present partly in solution and partly in a fine suspension, which gives to milk its opaque appearance, but with increasing acidity the physical properties of the casein are altered until finally it forms a smooth, firm clot.

Sour cream showing a tendency to curdiness is often received by butter factories. This also results from the development of excessive acidity bringing about partial precipitation of the casein. With a low testing cream there is a higher percentage of milk sugar than in cream with a higher test, thus favouring the growth of the acid-forming bacteria which convert the milk sugar into lactic acid. The liability to curdiness is increased in the warmer weather by setting the cream screw of the separator to deliver a thin cream, or by failure to replace all skimming discs in the separator bowl. The addition of warm cream to cool cream is another means of inducing curdiness.

Control.

Prevention of this defect in cream lies in adjusting the cream screw of the separator to give a cream containing not less than 34 per cent. of butter-fat between the months of April and September, and not lower than 38 per cent. between October and March; seeing that the skimming discs are tight in the separator, and that the animal heat has been reduced before blending freshly separated cream with that from a previous separation. Ordinarily about an hour must elapse before the cream has cooled sufficiently to mix, but with a cooler it is, of course, ready immediately. The cream should be stirred at least four times daily to ensure that bacterial action takes place uniformly throughout the mass.

PLATE 185.

The first waterfall, source of Coomera River. This is one of the ninety-nine waterfalls in the course of the Coomera in Lamington National Park. There are over 400 falls in the same park.

DATE CULTURE in QUEENSLAND

By H. J. FREEMAN, Senior Instructor in Fruit Culture.

(*Continued from page* 396, *April,* 1936.)

Irrigation.

THE date palm has the ability to adapt itself to a wide range of soil moisture conditions. In its native habitat it is only found growing in places where its roots have access to a constant water supply; it can, however, survive for long periods with very little water. During periods of drought, water is conserved by retardation or cessation of growth. In such cases, when water is again made available to the palm, normal growth is resumed without apparent ill effect upon the future thriftiness of the palm.

The actual amount of water used by a mature palm making a normal growth is only slightly more than that used by a mature citrus tree in full production and could be estimated at 50 acre-inches per annum.

The date palm under normal conditions is a deep rooted plant; it is, therefore, necessary to maintain an adequate supply of soil moisture to a depth of at least 6 feet for maximum growth response. The frequency and depth of irrigation applications to maintain this will depend largely on the soil texture, depth of root penetration, weather conditions, variety and size of palm, and the leaf area. During the summer months, the palms are making a vigorous growth and the fruit is developing rapidly. It is very important that no water stress occur during this period. Sandy soils usually require irrigations at ten to fourteen days' intervals, while a heavy clay loam may be allowed three or more weeks between irrigations.

After the fruit has reached a maximum size, the irrigation interval should be materially lengthened. A warm dry soil encourages more uniform ripening of the fruit on the clusters. The fruit is also subject to greater damage from rain when the soil is wet, following an irrigation, than when the soil is dry.

The variety and prevailing weather conditions influence materially the irrigation practice during the ripening season. With little or no rain and low atmospheric humidity, some varieties have a tendency to shrivel, but by keeping the soil moist, this tendency may be offset to a degree. Other varieties seem to improve in quality with a low soil moisture during this period.

During the first few years after the grove is planted, irrigation water is applied in the original basins. These should be gradually enlarged and supplemented by furrows between the basins. After the offshoots have been removed, the basins are filled in and the entire area irrigated. The system of irrigation will depend on the soil and the slope of the land.

PLATE 186.
Desert wasteland brought into date production, Deglet Noor, California.

Cultivation.

The principles and practices used in the cultivation of other fruit trees can be applied successfully to the date palm. The primary objects of cultivation are to aerate the soil, control weeds, ensure water penetration, and incorporate organic fertilizer into the soil.

The basins around young palms should be spaded at least once each year and new mulch added. The mulch keeps the surface from drying out and prevents grass and weeds from becoming established around the palm. Cultivation between the basins will consist largely in the control of weed growth.

After the offshoots have been removed, the basins are filled in and the entire area between the palms may be cultivated with a suitable farm implement. The type of cultivating tool and the depth of cultivation should be changed occasionally to prevent the formation of a plough sole. It is of particular importance to have the grove cleanly cultivated during the harvesting season. Weeds and grass growing under the palms will increase atmospheric humidity and make it difficult to keep the ground clean of fallen fruit.

Soil Fertility.

Very little experimental evidence is available concerning the fertilizer requirements of the date palm. However, it has been observed that where fertilizer has been applied, other factors being favourable, an increase in growth response and production has resulted. To fertilize intelligently, the grower must be guided by the general condition of the palm. This requires a close study of its growth and production. The palm should be maintained in a sufficiently thrifty condition to promote maximum fruit production with a minimum production of leaves. It is recorded that a palm producing twenty to thirty leaves annually develops a sufficient number of fruit clusters to maintain maximum production. Palms making a yearly trunk elongation of 18 to 24 inches will have a higher ratio of fruit clusters to leaves produced than a palm making a growth of 36 inches or more per year. This would indicate that there is a maximum beyond which it would not be commercially profitable to force growth.

PLATE 187.

Male blossoms, from which the necessary pollen is procured.

A study of the soil is necessary before any fertilization programme is adopted and soil analysis may be of some value in this connection. A survey of citrus tree development in the United States of America revealed that groves planted in good soil and unfertilized made more growth than trees growing in poor soils which were heavily fertilized. This doubtless would hold true to a certain extent with the date palm.

Furthermore, the date palm, which has a deep and extensive root system, will be likely to exhaust the original plant food supply in the root area less rapidly that the more shallow rooted citrus tree.

A study of the soils in Western Queensland has established the fact that they are usually deficient in nitrogen and organic matter, both of which can be supplied by liberal applications of farmyard manure. Green cropping is also essential if the fertility of the soil is to be maintained. As dates make their most rapid growth during the hot summer months, the aim of the date grower should be to have the soil in such a condition as to allow for development to the fullest extent. To do this, the green crops Beerseem, *Melolotus indica* (Sour Clover), Field Peas or Tares (Golden or Black) should be sown to allow for full growth during the winter and then ploughed in to a depth of 11 inches if possible during the late spring. In addition to adding fertility, these cover crops are of value in that the roots place organic matter into the subsoil, this in turn increasing the moisture-holding capacity of the soil as well as aiding water penetration. The application of artificial fertilizers has not been adopted to any extent in America, green cropping and up to one ton of farmyard manure per mature palm per annum always providing satisfactory results. In Queensland, I am of

PLATE 188.

A desirable male flower cluster has many large flowers borne on long strands producing an abundance of powdery, viable pollen.

the opinion that similar results would be achieved but the possible shortage of farmyard manure may warrant that an annual application be made to fully matured palms of the following mixture:—

Ammonium Sulphate	5 lb.
Superphosphates	12 lb.
Muriate of Potash	5 lb.

Systematic and efficient mulching with dry grass or wheaten straw is of very great assistance during the hottest months of summer.

PLATE 189.
Female date palm showing spathe just opening.

Pruning.

Pruning is largely confined to the removal of old leaves and spines. The number of leaves that a mature date palm should carry to secure maximum production is not definitely known. It is generally accepted that a date palm in full bearing should carry from 100 to 125 fully developed leaves. On those palms carrying the desired number of leaves, pruning is confined to the removal annually of a number of old leaves equal to the number of new leaves developed during the preceding year. In pruning leaves, the cut is made at the base fairly close to the fibre. Leaf pruning can be done at any time during the spring or early summer.

Aerial roots may form behind the cut leaf bases on the lower part of the trunk unless particular precautions are observed. These roots develop in the outer tissue of the trunk behind the moist fibres but finally die as they become exposed to the dry atmosphere. These old decaying roots supplemented with soil particles and other decaying organic material lodged between the old roots, stimulate growth on another cycle of roots. Each time a new growth of roots starts, the diameter of the palm is decreased, resulting eventually in the loss of the palm. This may be partially prevented by pruning the old leaf stubs close to the trunk and removing the fibre to a height of 3 to 4 feet from the ground after the offshoots have been removed.

PLATE 190.

Pollinating female date palm inflorescence with strand of male inflorescence.

Each year before blossoming begins, the spines are cut from the leaves produced during the previous year. This is done to facilitate working around the palm during the pollination and fruiting season. A sharp knife designed similarly to a pruning knife, but with a blade 10 to 12 inches long is well adapted for the purpose. Care should be exercised not to injure the midrib of the leaf.

Pollinating Dates.

In a natural or seedling group of date palms approximately an equal number of male and female plants would occur and pollination would result from wind borne pollen. In commercial groves, where it is desired to produce the maximum amount of fruit on a given cultivated area, it is necessary to limit greatly the male palms and to pollinate artificially. With hand pollination two good male palms will produce sufficient pollen to fertilize the flowers of fifty female palms.

Plate 191.

The two spathes on the palm illustrated have burst, an indication of the proper time for pollination. This operation should not be delayed more than two or three days beyond the stage indicated.

The selection of male palms should be given careful consideration. There is a great variation between them as to time of blossoming, number of blossoms produced, the size and shape of the blossoms, and the abundance and viability of the pollen. Furthermore, the pollen from different male varieties may influence the size of the fruit, the

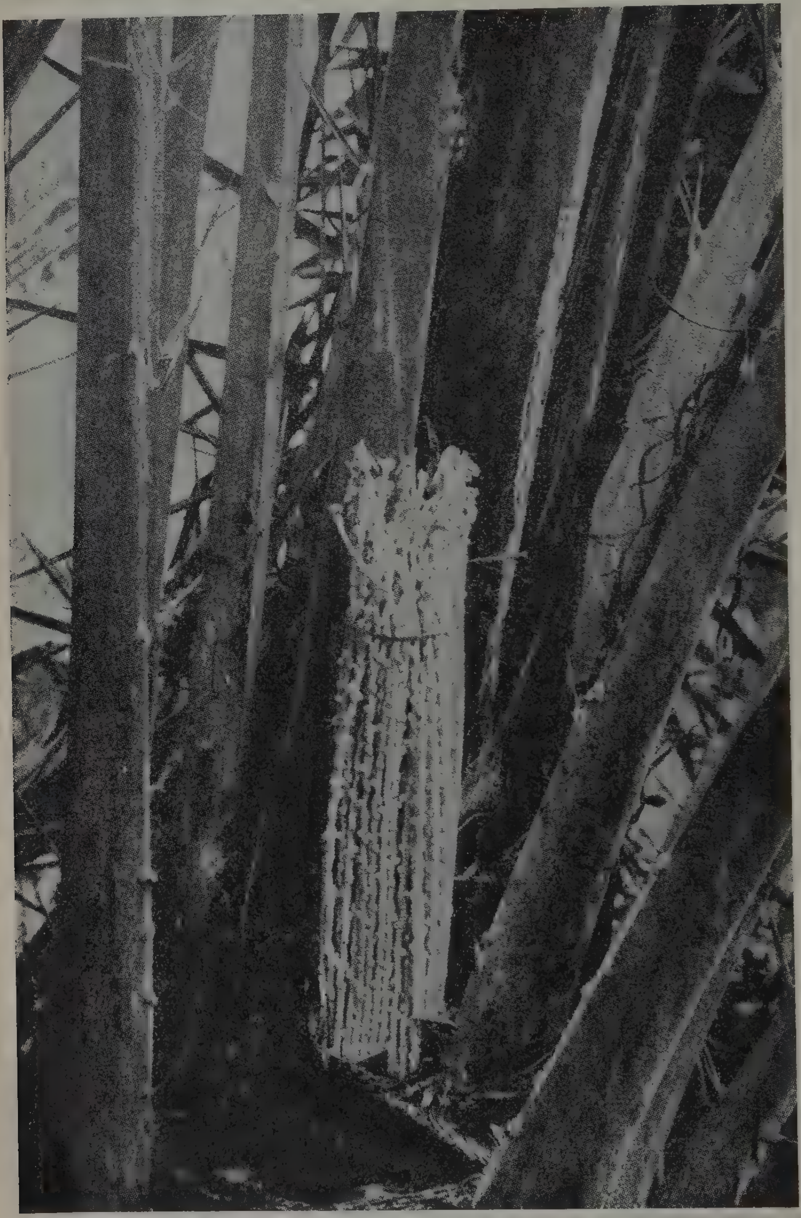


PLATE 192.

The sheath has been cut away from the female flower cluster and a few strands of fresh, male flowers bound in place in the centre of the cluster completes pollination.

size and shape of the seed, and the time of ripening. The chief requisites of a desirable male palm are that it blossoms at the same time or just prior to the female palms, and produces many large blossoms with long strands which have an abundance of yellowish, powdery, viable pollen. Coarse flaky pollen is usually associated with low viability and should be avoided. The final test for any male is the set of fruit produced by its pollen. It should be possible in the future for a prospective grower in Queensland to obtain offshoots from tested palms which will assure him a dependable supply of pollen.

PLATE 193.
Date fruit growth one month after pollinating.

It is desirable to collect the male blossoms within a few hours after the spathes split open. If they remain on the palm for a longer time, the individual flowers open, the pollen sacks are broken, and almost all of the pollen is carried away by the wind and bees. Pollen will remain viable throughout the blossoming period provided the flower clusters are properly handled.

The length of time a female flower is receptive to fertilization depends upon a number of factors and cannot be definitely stated. Differences between varieties, prevailing atmospheric conditions and possibly a physiological difference between the blossoms on the same palm tend to influence this period. Experiments in the United States of America indicate that the longer pollination is delayed after the spathe has burst, the fewer fertilizations will be effected. In commercial practice, where a heavy set of fruit is required, it is desirable to pollinate as soon as possible, never delaying more than two or three days. If rain occurs within twenty-four hours after a pollination has been made, it is advisable to repollinate after the weather clears.

There are several satisfactory methods of applying pollen to the female flowers. The more common and reliable method is to remove the sheath from the female flower cluster and place three to five strands from a recently opened male blossom upside down in the centre of the female cluster. A piece of strong twine is tied around the upper end of the cluster to hold the male flower strands in place and to keep the cluster in a compact form until the fruiting arm has elongated and the clusters worked down through the leaves into a permanent position. The twine is tied with a slip knot in such a manner that it will gradually loosen as the fruit increases in size.

PLATE 194.
Thinning dates when half matured, California.

Another method involves the removal of the strands from the male flower cluster and placing them on a screen or slatted tray in a dry well-ventilated room. The pollen which falls from the drying flowers may be collected and used for pollinating, either by dusting it directly on the female flowers or by working it into cotton wool and tying a small amount of this into each female cluster. It is desirable to use fresh pollen whenever available. However, a supply of dried pollen should be maintained throughout the season for emergency use in case fresh pollen is not procurable when needed.

Thinning the Fruit.

It has been shown that the fruit of the date palm could be materially increased in size by thinning. Also, it has been observed that heavily thinned clusters ripened their fruit more uniformly than clusters which were not thinned, the size of the dates increasing in proportion to the total number of dates removed from the palm. The amount of thinning required will vary with the variety and vigour of the individual palm. Palms that produce an excessive crop of fruit one year will bear a very light crop or possibly fail to fruit the following year. No arbitrary rule may be made governing the amount of thinning required to maintain a uniform crop with maximum production from year to year. Careful observations each season on the amount, quality and size of the fruit, correlated with the variety and cultural practices employed, form the only guide by which the grower can estimate the productive capacity of his grove. A reduction of one-third to one-fourth of the total number of fruit set on a given palm is suggested as a basis upon which a grower may start his thinning programme.

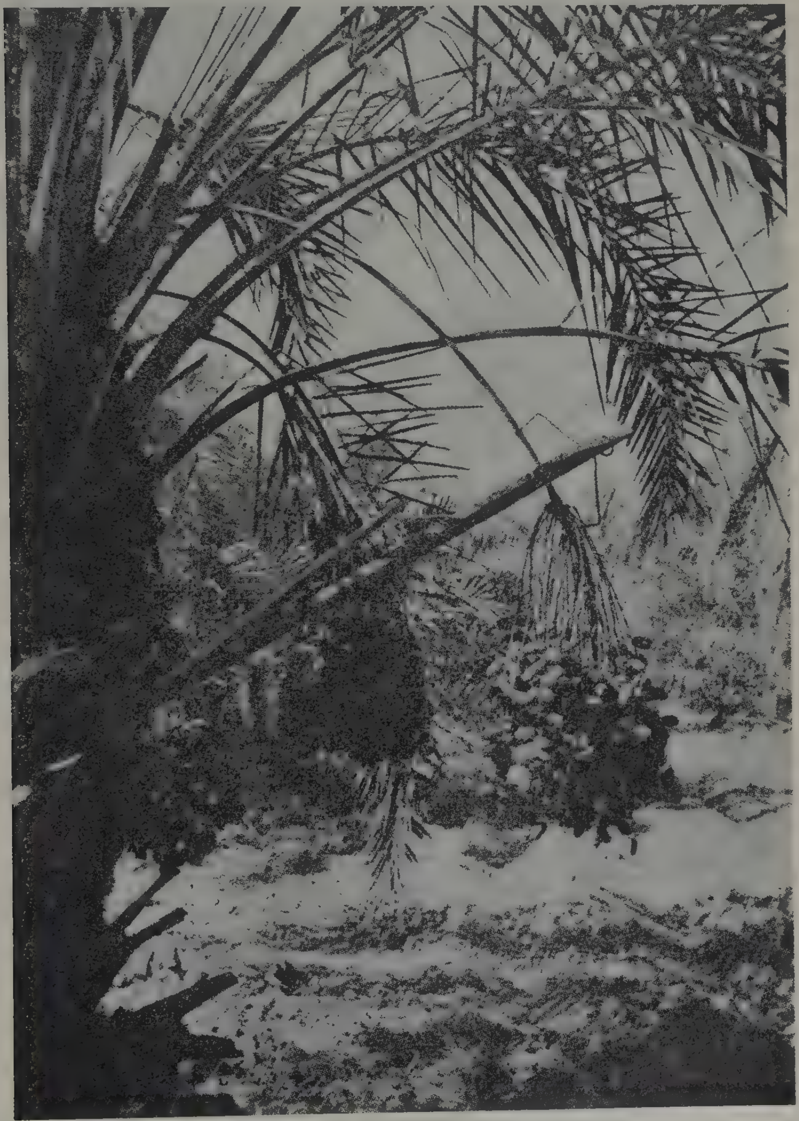


PLATE 195.

Before the fruit reaches full size the bunches should be supported to prevent breaking of the fruiting arm and to minimise wind damage.

There are several methods of thinning now used in commercial areas. The same method is not satisfactory for all varieties nor for all soil and climatic conditions encountered throughout dategrowing districts. For varieties which are subject to damage by rain, it is desirable to leave all strong flower stalks and thin by removing the strands from the centre of the clusters. This produces a relatively loose cluster which affords better air circulation, a desirable condition during damp, rainy seasons. Certain varieties, especially where grown in areas of low humidity and little rainfall, have a tendency to shrivel

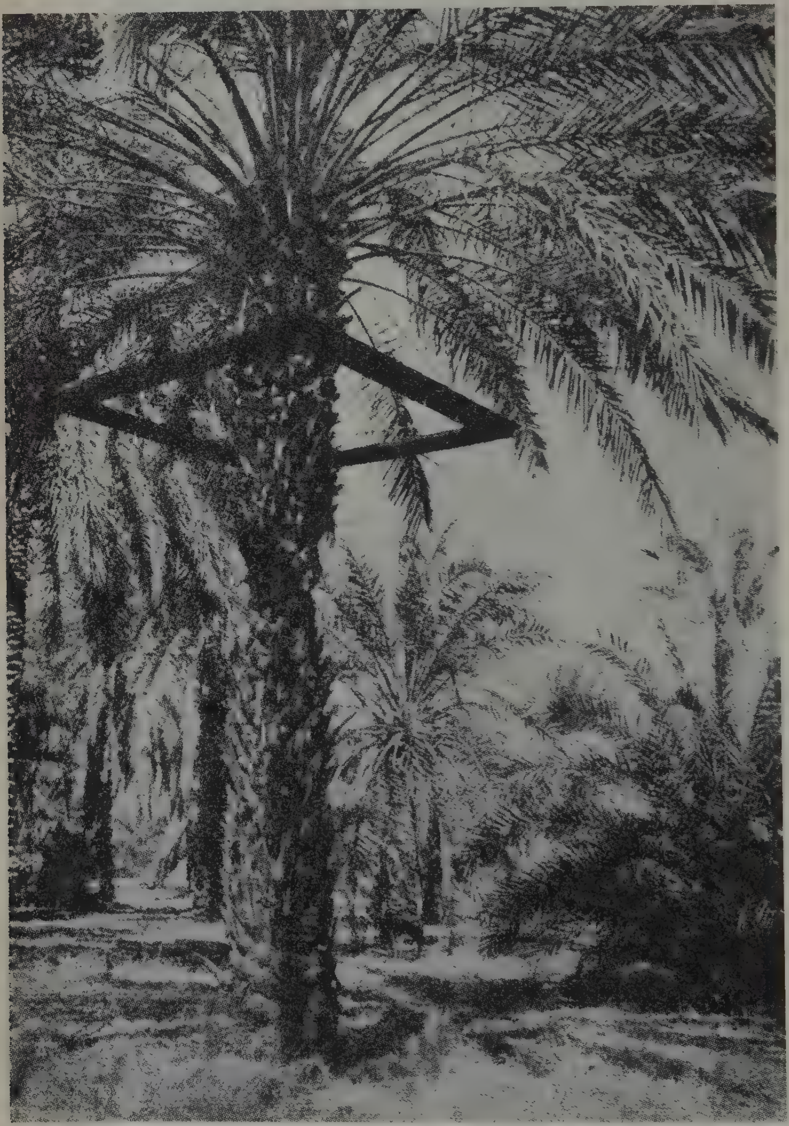


PLATE 196.

The use of permanently anchored platforms on tall palms minimises the handling of long cumbersome ladders and greatly reduces picking costs.

or become puffy as they ripen. In such cases, it is advisable to keep the clusters as compact as possible to prevent excessive loss of moisture from the fruit. This is accomplished by removing entire clusters or by removing the lower portion of all strands on individual clusters.

Thinning is usually done at the time the blossoms are pollinated, but it may be done at any time before the fruit reaches approximately one-fourth of its maximum size.

Supporting the Clusters.

After the fruiting stem has reached its full length, the weight of the rapidly developing fruit will force the cluster down through the leaves. It is important to direct the clusters so that they will hang freely and be equally distributed around the palm. When the berries have reached approximately three-fourths maximum size, the clusters should be supported to prevent the kinking or breaking of the fruiting arm, and to minimize the wind damage.

Light clusters may be tied to adjacent leaves for support, but large heavy clusters require a special brace. A commonly used brace consists of a 1 inch by 3 inches stake 3 to 6 feet long, bevelled at one end, with a heavy specially designed hook fitted to the bevelled end. This hook is made of heavy wire, 24 inches long, twisted to give a 2-inch eye in the centre parallel to the arms with the ends bent in a 3-inch semicircle at right angles to the arm. The fruiting stem rests in the half circles of the hook, one half circle being fastened in front of the first whorl of strands on the cluster to prevent slipping on the fruiting stem. The bevelled end of the stake is fitted into the eye of the hook and the other end is wedged behind a leaf base. A more simple and less expensive method is to tie one end of the stake securely to the base of the fruit cluster with a light rope in place of using the hook described above.

Harvesting the Fruit.

As all dates on the fruiting clusters do not ripen at one time, it is necessary to make several pickings during the season. The rate of fruit ripening appears to be influenced by the same factors as those influencing the rate of palm growth. Those varieties ripening early in the season when the minimum temperatures are quite high, have a shorter ripening period than do those ripening later. Likewise, cold weather during the autumn retards ripening and warm weather accelerates it.

It is essential that the fruits have a high percentage of their sugar accumulated before they are picked from the palm, if a high quality product is to result from artificial ripening. The fruits of nearly all varieties ripen from the distal end toward the calyx. During ripening, the flesh becomes pliable and the colour changes to a light translucent amber in the light coloured, soft and semi-soft varieties. The influx of sugar differs in the early and late maturing varieties and data obtained indicates that the sugar content of the early maturing varieties continues to increase until the fruit reaches the fully translucent stage. If such fruits are picked when they show the first signs of ripening, an inferior product characterised by a tasteless, watery flesh will result. If dehydrated or held in storage, the flesh separates from the skin and dries to a leathery consistency unfit for commercial purposes. Fruits ripening late in the season accumulate the greater part of their sugars before the flesh begins to soften. Therefore, they can be picked and ripened into a high quality product at a much earlier stage of maturity.

Fruits which remain on the palm until fully ripe become darkened in colour, wrinkled or puffy, and considerable loss may occur during periods of unfavourable weather due to souring. Also, the loss from birds, insects, and handling will be greatly increased.

Two methods of picking are now used in commercial groves. In one, the date is detached from the calyx by means of a twisting motion of the fingers. The other method is to clip the date from the strands leaving the calyx attached to the fruit. The latter method increases the cost of picking but adds to the attractiveness of the fruit. Fruits of the soft type must be handled with care to prevent crushing or injury to the skin. This is best accomplished by using a shallow picking container holding not more than two layers of dates. The firm varieties may be picked less carefully, using deeper containers, without damage to the fruit.

The dry or bread dates are easily picked as all the fruit is allowed to become fully ripe and dry on the cluster. The cluster is then cut late in the season and the dates removed.

Ladders are used for picking the fruit when the palms are small, but as they grow in height, the long ladders used become more and more unwieldy. This has necessitated the use of picking platforms for the taller palms from which all the fruit clusters can easily be reached. The cost of these platforms is more than offset by the saving of labour involved in the pruning, pollinating, thinning, bracing, protecting clusters, and picking. A very satisfactory type of permanent platform is shown herein.

Effect of Rain during the Ripening Season.

Rain, followed by periods of high atmospheric humidity during the ripening season, may cause serious injury to dates. This injury is of two types—first, the cracking or bursting of the skin, and second, loss due to souring (bacteria and moulds).

The flesh of the date fruit contains relatively large amounts of sugar. This high sugar concentration within the fruit causes it to absorb water readily in atmospheres of high relative humidities of 80 per cent., or higher or when placed in direct contact with water. Tests made to determine the amount of water absorbed by certain varieties of dates after heavy rain gave the following results: The moisture content of green and 20 to 30 per cent. ripe fruit, which was determined before and after the rain, showed that the dates absorbed 3.6 and 6.95 per cent. moisture, respectively. The higher sugar content of the partially ripened fruit apparently caused it to absorb more moisture than the greener fruit. Fully matured fruits have a high percentage of dry matter and moderate quantities of water may be absorbed without injury. Undue absorption of the water causes a rupture of the skin, the extent of injury depending upon the amount and duration of the rain, the subsequent weather conditions, the variety and the stage of maturity of the fruit.

Damage to fruit periods subsequent to rain is frequently more severe than that resulting directly from the excessive absorption of water. After the skin of the date is ruptured, bacteria, moulds, and yeasts find a favourable medium for growth in the syrupy flesh of the date, causing it to sour and rot. Fruits injured in the green stage apparently do not offer so favourable a medium for organisms as do the more ripened fruits, and the cracks are readily healed by the drying out of adjacent tissues and become very conspicuous as the fruit approaches maturity. Fruits scarred in this manner may mature with no loss except that the grade is lowered. However, certain varieties are seriously damaged by a condition following severe marking, known in America as "Blacknose," and characterised by the darkened and desiccated condition of the distal end of the fruit.

Protecting Fruit Clusters.

Whilst in America, I noticed various types of covers devised to protect the fruit from rain, but none appeared absolutely efficient. The ideal protector would be one possessing the following attributes:—(1) Waterproof, (2) allowing free circulation of air throughout the fruit cluster, (3) designed for ease in handling whilst the fruit is being picked, (4) fashioned to exclude insects and birds, and (5) economical.

To devise such a protector is still an aim to be achieved for all the above qualifications must be incorporated. Otherwise, covers have to be put on to protect the fruit from the rain and later removed to allow for air circulation. If this is not done, it is likely that the fruit will become syrupy and some of it will sour and mould.

Whatever form of protection is used, it does not seem advisable to cover the clusters until just before the fruits begin to ripen. If covered earlier in the season, considerable loss by sunburn is likely to occur by fruit touching the covers where exposed to full sunlight. The covers may be attached and folded back, exposing the fruit until rain is imminent when they should be pulled down.

Grove sanitation is a very important factor in decreasing the loss of fruit from bacteria, fungi, and insects, especially during unfavourable ripening conditions. Injured, over-ripe and diseased fruit should be picked from the clusters and removed from the ground beneath the palms and either buried or otherwise destroyed. This is particularly helpful in controlling both insect and fungi diseases.

[TO BE CONTINUED.]

* * *

PRODUCTION AND CONSUMPTION—THE URGENT TASK.

The hard lesson of adversity had taught them that the prosperity of all nations depended on the prosperity of each. In these days of swift transport and communication, and interlocked commerce and finance, it was true to an increasing extent that nations could not live to themselves alone. The world-wide trade depression and economic disturbance had been largely caused by maladjustment of distribution.

The potential output is far greater than ever before. If all employable labour were employed for a reasonable number of hours per week, the world would have at its disposal a volume of commodities and services that would enable the entire population to live on a higher level of comfort and well-being than has ever been contemplated in the rosiest dreams of the social reformer.

The urgent task is to bring consumption and production into a proper relationship—not a simple, but quite a possible task.—*From a report of an address by His Majesty the King, when Prince of Wales, to an international congress of commercial educationists.*

Fat Lamb Raising

PURCHASE OF MERINO RAMS.

THE Minister for Agriculture and Stock, Mr. F. W. Bulcock, made the following announcement recently:—

As the Government is aware of the serious losses suffered by many sheep farmers throughout the State following on recent droughts and owing to the recent improvement in the seasons, the initiation of the scheme referred to herein for the purchase of flock rams is considered most opportune. Such scheme, however, has only been in force a few months and an effort is now being made to further broadcast its advantages.

Obviously, the assistance must be limited to those farmers who may have reached the limit of their overdrafts or, in other words, exhausted their present borrowing limit, and consequently are unable to acquire without financial help the required rams so necessary for the re-building of their flocks.

This method of assisting necessitous small farmers is already in vogue in the sister State and, it is understood, with very beneficial results. Generally, the scheme is to enable merino sheep breeders, who own not more than 1,500 breeding ewes, to buy flock rams to the extent of two per cent. (2 %) of their flocks and/or to replace impotent ones; therefore, the maximum number that could be purchased by one individual would be thirty (30) and the Government, through the Rural Assistance Board, is prepared to advance up to eighty per cent. (80 %) of the landed cost of the rams purchased. The security required would mostly be limited to an order on the proceeds of the wool sales; the interest rate would be only four per cent. (4 %) and the repayment terms would be fixed so that no embarrassment would be caused to the borrower.

In all cases officers of the Department of Agriculture and Stock will, on application, furnish any intending applicant with the names of merino stud breeders, districts, &c., and any other relevant information which may be required. Again, any stock and station agent, who has clients interested herein, may apply to the Board before mentioned, Box 111B., G.P.O., Brisbane, for a supply of the necessary application forms and any further details relating to the scheme. Intending applicants, of course, may also apply direct to the Board or the local Agricultural Bank Inspector, if so desired.

In certain cases where applicants are in a position to offer security, loans may be advanced to sheep farmers in excess of the limits referred to in this announcement. It is hoped as the result of the policy outlined herein that those interested will take advantage of it with the ultimate objective of building up their flocks in a manner calculated to not only considerably benefit themselves but the State of Queensland generally.

QUEENSLAND SHOW DATES.

May.

Taroom, 4 to 6.
Longreach, 4 to 7.
Goondiwindi, 1 and 2.
Biloela, 7, 8, and 9.
Beaudesert 6 to 9—Show 6 and 7, Camp Draft 8 and 9.
Charleville, 5 to 7.
Wowan, 14 and 15; Rodeo, 16.
Murgon, 7 to 9.
Mundubbera, 6 and 7.
Goomeri, 13 and 14.
Mitchell, 13 and 14.
Gayndah, 13 and 14.
Ipswich, 19 to 22.
Roma, 19 to 21.
Biggenden, 21 and 22.
Gympie, 22 and 23.
Dirranbandi, 22 and 23.
Warrill View, 23.
Maryborough, 26 to 28.
Toogoolawah, 29 and 30.
Kalbar, 30.
Kilkivan, 25 and 26.
Emerald, 27 and 28.
Gin Gin, 29 and 30.

June.

Childers, 1 and 2.
Bundaberg, 4 to 6.
Lowood, 5 and 6.
Boonah, 10 and 11.
Gladstone, 10 and 11.
Esk, 12 and 13.
Rockhampton, 23 to 27.
Laidley, 24 and 25.
Marburg, 27 to 29.
Mackay, 30 June and 1 and 2 July.

July.

Proserpine, 3 and 4.
Kilcoy, 2 and 3.
Bowen, 8 and 9.
Townsville, 14 to 16.
Cleveland, 10 and 11.
Ayr, 10 and 11.
Rosewood, 10 and 11.
Nambour, 16 to 18.
Charters Towers, 21 and 23.
Cairns, 21 to 23.
Maleny, 23 and 24.
Atherton, 28 and 29.
Gatton, 29 and 30.
Caboolture 31 July and 1 August.

August.

Barcaldine, 4 and 5.
Pine Rivers, 7 and 8.
Royal National, 17 to 22.
Home Hill, 28 and 29.

September.

Tully, 11 and 12.
Innisfail, 18 and 19.
Malanda, 30 September and 1 October.
Southport, 26.
Imbil, 4 and 5.
Pomona, 11 and 12.
Beenleigh, 18 and 19.

Agricultural Notes

ANUARY and March rainfall registrations were generally over average throughout the agricultural areas, less fortunate districts being Gayndah and the Darling Downs. During April, although heavy rains were received throughout the far-northern coastal lands, only light, scattered showers fell elsewhere, so that at the time of writing pastures are drying off and all growing crops are in need of good soaking rains. The Townsville, Rockhampton, and Maranoa districts have experienced an excellent season as far as grass and water supplies are concerned, although, with the approach of winter, the pastures are losing their succulence, resulting in the normal decline in dairy production. On the Darling Downs, particularly the southern and south-western districts, droughty conditions prevail, many properties being eaten out, and seasonal crops are showing the effects of the dry period. A fair body of grass was in evidence during January, but the following heat wave and drying winds had a detrimental effect on all pastures. Summer crops have therefore produced only light yields, that of the late-sown maize being insufficient to meet local requirements.

Kapok.

''Ageratum,'' South Bundaberg, in a recent letter requests information in regard to the growing of kapok (*Eriodendron anfractuosum*). This is a large, quick-growing, thornless tree which thrives in tropical lands from sea-level to an elevation of 2,500 feet. It is deciduous in the dry season, the greenish-white flowers being produced in clusters shortly after the leaves have dropped. The pods ripen about 2½-3 months after flowering, but should be collected before they are quite ripe and dried in the sun. The floss or kapok fibre is utilised chiefly for stuffing pillows, &c., and for mixing with other fine fibres for textile purposes.

Java and the Philippines provide the bulk of the world's requirements of kapok fibre, the export from Java alone approximating 12,000 tons annually. Cleaned kapok is valued in London at about 8d. per lb. The tree is propagated from seed, or from cuttings spaced 15 feet by 15 feet apart, and commences to yield in the fourth year. A mature tree at fifteen years old would produce 6 to 9 lb. of clean floss. In view of the labour involved in picking and shelling, kapok-growing does not appear to offer great inducement for large-scale production under

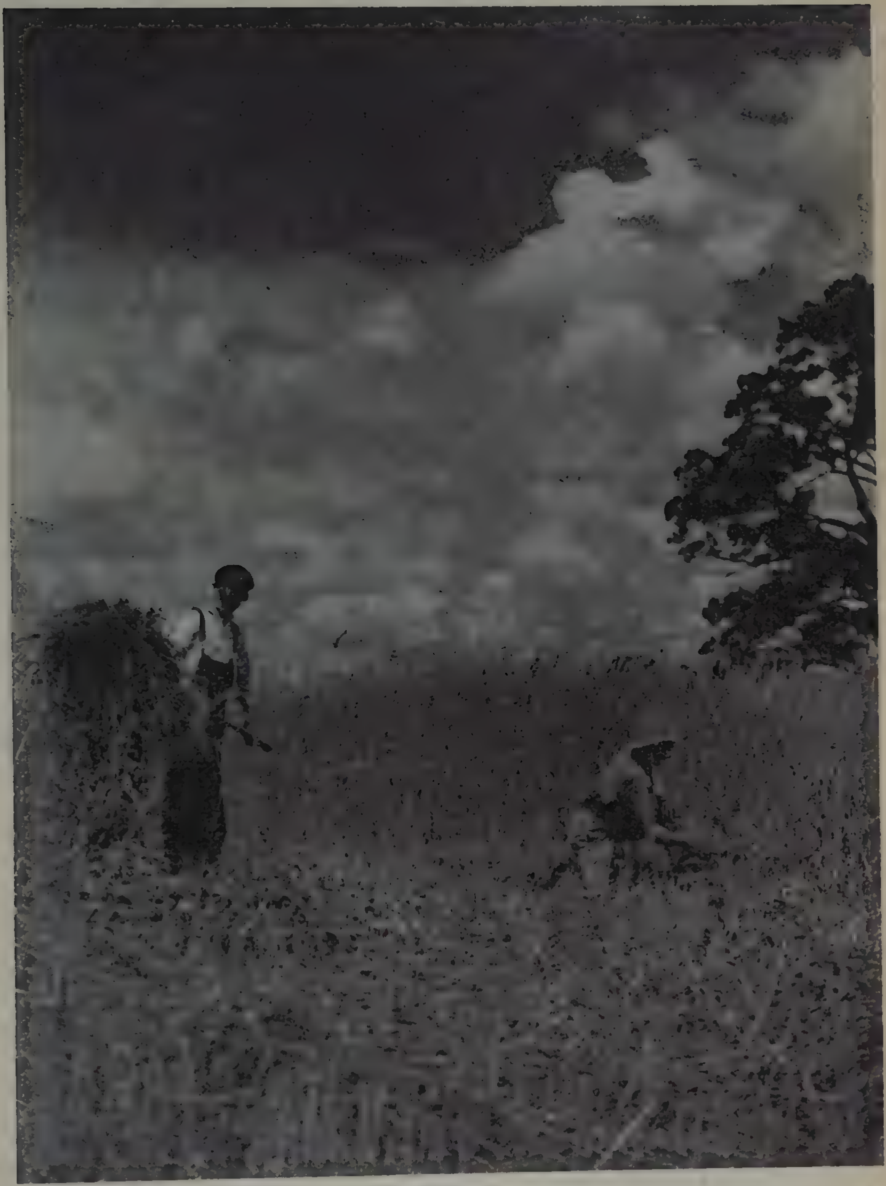


PLATE 197.

FIRST LESSONS IN FARMING.

Harvesting fodder for dairy stock, St. Lucia Farm School.

Australian conditions, although a market could doubtless be secured for good-quality fibre.

Wheat.

The census of wheat varieties for the 1935-36 season discloses that Florence has maintained its lead with an acreage of over 47,000, or 15·62 per cent. of the total area placed under crop. This popular variety is followed by Three Seas, Flora, Pusa, Gluyas, Cedric, and Clarendon, the seven leading varieties being responsible for 62·92 per cent. of the State's acreage under wheat. Numerous other varieties are grown, many in areas too small to record as a percentage of the crop, and it is considered that many such varieties could be eliminated with benefit to the growers concerned, besides simplifying the task of the Wheat Board's classification staff.

PLATE 198.
Harvesting a heavy crop of Sudan grass, Coreena Station (Central Queensland).

Tobacco.

In spite of the excessive rains which fell in the northern tobacco areas, reports now evince the fact that the amount of damage occasioned is not by any means as severe as was at first estimated. Indications are that the yield will be heavier than expected, as the leaf has developed in both body and size, and although the colour will not be as bright as previously, good quality leaf will result. The late-planted crops, however, have made disappointing growth and only light yields will be recorded. Except in odd instances, curing has been completed in the Texas and Miriam Vale areas.

With the object of further minimising the risk of carrying over disease and pests from one season to another, a move is on foot to establish a closed period of two to three months when no tobacco will be grown. This will, of course, vary in the different districts.

Sugar.

The cane crops in all sugar areas made good progress during early April, but the advent of cooler conditions has caused a cessation of growth in the southern districts. It would now appear certain that the 1936 crop yield will exceed that of the previous season. Preliminary estimates will be gathered during May.

Horticultural Notes

FRUITGROWING IN NORTH QUEENSLAND.

By S. E. STEPHENS, Instructor in Fruit Culture.

WEATHER conditions have been wet throughout the quarter. The rainfall at Cairns amounted to 58.95 inches, of which 16.76 inches fell in January, 29.57 inches in February, and 12.62 inches in March, the number of wet days being respectively seventeen, eighteen, and twenty.

The weather throughout the northern area has been particularly suitable for the growth of all crops and they are responding remarkably well.

Citrus.

Local lemons have been on the market throughout the quarter. Although largely green in colour and in an uncured state the quality has been very good.

Local common oranges came on the market towards the end of February, whilst marketing of mandarins was commenced late in March.

In the Cardwell area, which is the largest citrus-producing district in the northern area, the size of crop in the orchards is variable. Orchards which have received reasonable care and attention are, this year, carrying heavy crops whilst others which have been neglected are showing the results of the neglect in the lightness of the crop and general unhealthy condition of the trees.

In the Cairns district the crop generally is heavy. Unfortunately, fruit fly has already commenced its attack on the fruit.

Bananas.

The quality of fruit produced this quarter has been of fair standard. Thrips have, however, become very prevalent and practically all fruit marketed in Cairns has been more or less affected with rust discolouration of the skin.

Pineapples.

The summer crop was not completed on the Tablelands until well into February. The acreage there being small, no difficulty was experienced in disposing of the crop on the local markets.

The autumn crop commenced to ripen in Cairns early in March, and fruit of good quality has been available here since that time.

Mangoes.

The crop in the coastal districts was finished by the end of January. In many of the Tableland areas, notably around Irvingbank and Watsonville, the early part of the crop was only commencing to ripen at that time, consequently harvesting extended into March.

Granadillas.

Vines made excellent growth during the quarter under review. The early autumn crop commenced to ripen about mid-March, and towards the end of the month fruit of good quality were plentiful.

Papaws.

The new plantings made during last quarter have shown good progress since, when conditions for growth have been exceptionally suitable. Fruit has been plentiful and of fair quality. The flavour was slightly deficient on account of wet conditions, but should return to normal during the coming quarter.

Miscellaneous Tropical Fruits.

The majority of purely tropical fruits matured crops during this quarter and included Bread Fruit, Jack Fruit, Five Corners, Malay Apples, Mangosteens, Mabolos, Vi-apples, Longans, Cashews, Sugar apples, and Star apples. The quality of these various fruits was chiefly good and amply demonstrates the suitability of North Queensland for the production of the strictly tropical fruits.

Avocados.

Early fruits of this tree ripened at the end of February. Although a number of trees have been planted throughout the North, the plantings have been only in ones and twos, no commercial areas being yet laid down.

Temperate Fruits.

The grape crop was this year a good one, but the hopes of growers for a good harvest were not fulfilled owing to extensive damage by birds. All measures taken by the growers to cope with the invasion proved fruitless and nearly all crops were heavily reduced.

The plum crop was good and escaped fruit fly depredations until late in the season, thus allowing the growers to harvest the majority of their crop without loss.

The persimmon crop was again a heavy one and commenced ripening in early February.

Seeds and plants of various kinds have been supplied to the South Johnstone Experiment Station, notably some 400 odd tea seed, pepper seed, and plants of Jack fruit, coffee, vanilla, &c. Many distributions of tropical seeds and plants have also been made to interested persons.

CITRUS NOTES.

R. L. PREST, Instructor in Fruit Culture.

THE harvesting of early varieties of oranges, mandarins, and grape fruit has commenced. The onus is on the growers to ensure that these fruits have reached full maturity, as the maturity standards are being rigidly enforced.

The maturity standards for citrus fruits are—In the case of oranges, grape fruit, and mandarins, the weight of hand-pressed juice must be not less than 30 per centum of the total weight of the fruit. With regard to the juice, the acidity test for navel oranges and mandarins requires that 10 cubic centimetres of juice shall be neutralised by not more than 26 cubic centimetres of deci-normal (N/10) alkali; while, with regard to the juice of oranges, other than navel oranges and mandarins, 10 cubic centimetres of juice must be neutralised by not more than 3 0cubic centimetres of deci-normal (N/10) alkali.

Graduated pipettes and supplies of deci-normal (N/10) soda solution may be purchased through the Committee of Direction of Fruit Marketing.

Colouring Mature Citrus Fruits.

Certain varieties of oranges and mandarins are satisfactory and desirable as food although they are still green in colour. Such varieties, when left on the trees to become fully coloured, deteriorate as regards their eating quality, while in some districts the adverse weather conditions experienced late in the season frequently result in skin-blemished and scalded fruits, which, if not a total loss, are at least greatly reduced in market value.

It has been found during recent years that the introduction of certain gases during the sweating process, such as carbon monoxide acetylene and ethylene, accelerates the colouring of mature citrus fruits. Greenness in citrus fruits suggests immaturity, and militates against the satisfactory marketing of such fruits. In order to colour such fruits satisfactorily they must reach a certain stage of maturity, as if too green and immature they will not develop a normal colour.

All fruits to be coloured require to be treated with special care in handling. Bruises will show up as greenish areas; oil liberated from the rind may cause spotting; while if the residues of oil or Bordeaux sprays remain on the fruit, it will be found to come from the colouring room spotted and unsightly.

Any ordinary room lined with timber, provided it is air-tight, can be used for colouring citrus fruits. A convenient and economical size is one to hold from 40 to 50 bushel cases; allowing 5 cubic feet of air space to each bushel case, the chamber would require to be of from 200 to 250 cubic feet in capacity. Even where large numbers of cases are to be treated it will be found more satisfactory to build two medium-sized chambers than one large chamber.

For oranges, lemons, and mandarins an average temperature in the chamber of between 65 and 75 deg. Fahr. will prove satisfactory. If the temperature falls below 65 deg. Fahr. the colouring process will be retarded. On the other hand, high normal temperatures are not likely to affect the fruit, no ill effects having been shown by temperatures up to 89 deg. However, the humidity will require to be adjusted; in the case of a very dry atmosphere an open container of water may be introduced to moisten the air and prevent withering of the fruit; while, when the humidity is high and likely to cause softening of the friut, it may be reduced by placing sand, caustic soda, or quicklime on the floor of the chamber.

The fruit should be graded for colour and placed loosely in open cases having plenty of ventilation. Dunnage should be used in stacking in order to permit a free circulation of air around each case.

The required quantity of carbide should be placed in a suitable container, and a second vessel containing water arranged in such a manner as to permit the water to drip slowly on to the carbide, thus generating the acetylene gas. This apparatus may be fitted either inside or outside the chamber; if the latter, of course, the gas will have to be led inside the chamber by means of suitable piping.

After closing the chamber and making sure that it is airtight, it should be charged and allowed to remain closed for four hours. It should then be opened up and thoroughly aired for at least two hours, after which it may be charged again, and the performance repeated as often as is necessary. Between nine and fifteen charges should be sufficient to give mature citrus fruits their normal colour.

It has been found that a very small quantity of acetylene gas (1 part in 2,500 to 1 part in 1,875) satisfactorily colours mature citrus fruits. In order to determine the dosage required, the air space remaining after the chamber has been loaded must be known. One ounce of carbide generates sufficient gas for every 75 cubic feet of air space. For all practical purposes it is sufficient to allow 1¼ cubic feet displacement for each bushel case of fruit. For example, the following table illustrates the dosages required for a chamber of 200 cubic feet capacity with a varying number of cases:—

No. of Bushel Cases.	Air Space.	Dosage.
40	150 cubic feet	2 oz. carbide
20	175 cubic feet	2⅓ oz. carbide
10	187½ cubic feet	2½ oz. carbide

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FRUIT MARKETING NOTES.

By JAS. H. GREGORY, Instructor in Fruit Packing.

WITH the arrival of the month of May it is realised that winter is close at hand. We have seen the last of many fresh fruits for this year, grapes, apples, pears, and stone fruits having had their season. From now on attention must be given to the raising of next year's crop. However, pruning has not yet been started, and it is at this period that growers on the Tablelands have some respite from the long days of toil required during harvesting operations. Frosts have commenced to make their presence felt, to the detriment of late tomatoes, beans, and other kitchen supplies. At this period of the year growers should take the opportunity of doing odd jobs connected with packing-house hygiene, the manufacture of home-made equipment, and repairs to plant; pest eradication also should receive attention. Stored fruit should be examined, and specky specimens carefully removed and destroyed.

Packing-house Hygiene.

For many reasons codling moth has been bad this year, and efforts should be made to minimise the trouble for next season. Apple-picking boxes, packing sheds and plant should have all cracks and crevices inspected for the presence of the larvæ of this pest, and all specimens found should be carefully destroyed. The dipping of boxes in boiling water is of benefit, and will amply repay the trouble. Old stone fruit cases containing rotted specimens should be either carefully sprayed with a lime-sulphur solution or dipped in boiling water. These precautions, if taken, will greatly assist in the elimination of disease in next season's crop.

Shed Equipment.

Home-made sizers, case-making benches, paper needles and holders, packing stands and spring boards, can all be put together cheaply at home, and should be spare-time jobs.

Prospects for the year appear brighter than for a long time past. Good fruit has sold more easily and at higher levels than for some years. Growers would do well to try to market their fruit regularly rather than haphazardly in an effort to obtain the best of the market prices.

The following conditions and prices have prevailed during the past few weeks:—

Stone Fruits.

Stone fruits have now finished for the season, which has been a fairly satisfactory one for most growers with the exception of those who experienced hail damage. Spraying the packing shed with a 5 per cent. solution of formalin should assist greatly in checking the incidence of brown rot next season.

Grapes.—Prices for grapes were maintained during last month, and the finish of the season saw from 9s. to 11s. per half-bushel being obtained for choice Waltham Cross and Purple Cornichon. Future supplies will be obtained from cold storage. Growers holding fruit in cold store should have it inspected frequently from now on.

Pears.—Local pears are now finished, supplies of this fruit coming from the Southern States. Prices have been—Packhams, from 7s. to 9s.; Winter Cole, from 11s. to 13s.; Beurre de Capiaumont, 6s. to 8s.

Apples.—Dunns, from 5s. to 7s.; Democrat, from 8s. to 9s.; Granny Smith, from 8s. to 12s., for local supplies, which are now practically finished; Southern Jonathans (2½ and 2¾ inches), from 11s. to 12s. (2¼ inches), 9s.

Growers harvesting late fruit are now reaping the benefits of good prices. Those who have Jonathans in cold store should now commence to watch them very closely for any sign of deterioration. Granny Smiths, Dunns, and Delicious should not start to deteriorate for some weeks yet and should cause no anxiety. Export consignments are now practically completed.

Exporters should now put their affairs in order by checking over stamps, stencils, and other implements, and repairing and replacing same where necessary. The stencils or stamps "Extra Fancy" and "Fancy" are necessary, also the packing counts for both the Dump and Standard cases.

The following is a list of counts for export and home markets:—Dump Case—68, 75, 83, 90, 96, 98, 108, 120, 132, 144, 156, 168, 175, 182, 193, 210, 228, 245, 263, and 270. Standard Case—48, 56, 64, 72, 80, 88, 96, 100, 113, 125, 138, 150, 163, 175, 180, 198, 216, 234, 252, and 270.

The practice of using pencil or crayon for marking the count on cases is too prevalent at the present time, and does not do justice to the quality of fruit that is grown in Queensland. Stencils can easily be cut by growers from thin sheet zinc, whilst rubber stamps are cheaply procurable.

Tropical Fruits.

Papaws have eased in price, locals bringing from 2s. to 6s. per bushel, and Yarwuns from 7s. to 9s. per bushel and a-half. We again draw attention to the increased necessity for paying strict attention to colour and maturity. The Sydney prices of from 12s. to 14s. per tropical case should show a satisfactory return. When sending to the South it is necessary to pay careful attention to packing.

Custard Apples.—With the advent of heavier supplies prices have eased to from 4s. to 5s. per case. It is well to remember that only matured fruit is wanted, as nothing ruins the custard apple market more quickly than green fruit colouring to a black colour, when it is so-called ripened.

Pineapples.—Complaints have been received from Southern markets that green fruit has been sent. Fruit of this type very quickly has a detrimental effect on Southern markets at this period of the year, particularly as new season's oranges and mandarins are now coming on the market.

Brisbane prices for Smooths have been from 3s. to 8s. per case and from 2s. to 6s. per dozen, and for Ripleys from 8s. to 11s. per case and up to 7s. per dozen; Sydney prices from 6s. to 12s. per case; Melbourne from 8s. to 14s.; and Adelaide from 14s. to 15s.

Bananas.—Prices have improved during the past few weeks on the Brisbane market, and strike a more hopeful note for the industry. Brisbane prices have been—Sixes, from 6s. to 12s., sevens, from 10s. to 13s. 3d., eights, from 11s. to 13s. 6d., and nines, from 12s. to 13s. 9d.; Sydney prices—Sixes and sevens, from 10s. to 14s., eights and nines, from 14s. to 16s.; Melbourne—Sixes, from 10s. to 12s., sevens, from 12s. to 13s., eights and nines, from 14s. to 15s.; Adelaide—from 18s. to 22s. It is the time now for the best packing methods to be used. Be sure that the fruit is properly filled before cutting.

Citrus Fruits.

All varieties of citrus fruits are now on the market, and growers must take care that all fruit conforms to the required maturity standards. To pass the test it is necessary that 10 cubic centimetres of juice shall be neutralised by not more than 26 cubic centimetres of deci-normal alkali (N/10 soda) in the case of navel oranges and mandarins, and by not more than 30 cubic centimetres in the case of other varieties of oranges. A good market for prime mandarins and grapefruit exists in the Southern States. Prices are as follows:—

Oranges.—Commons, 5s. to 8s., Navels, 8s. to 14s. in Brisbane; Melbourne prices—Navels to 15s., Commons, 9s. to 10s., Local Valencies, 5s. to 13s.

Mandarins.—Melbourne prices for Fewtrells from 12s. to 14s., Brisbane prices, 7s. to 12s.

Lemons.—Market in Brisbane quieter; prices for Gayndah district 12s. to 17s., Esk district, from 12s. to 14s., local coastal, from 6s. to 9s.; in order to command high prices it is necessary that lemons marketed be cured and free from blemishes.

Grapefruit.—A good demand on all markets is indicated for choice fruit of the Marsh type, Brisbane prices being from 7s. to 9s., whilst for other varieties they were only from 4s. to 6s.; Melbourne prices for Marsh Seedless were from 10s. to 15s., while other types brought only 7s. to 9s. per case and were hard to move.

Miscellaneous Fruits.

Tomatoes still remain dull property on all markets. Brisbane prices ranged from 1s. up to 3s. 6d. for coloured lines; Melbourne and Sydney prices were from 7s. to 10s. Frosts have seriously curtailed the remainder of the crop in the Granite Belt, which may have the effect of raising values.

Passion Fruit.—Melbourne provided only a fair demand with prices from 6s. to 7s. per case, while Brisbane prices were from 3s. to 9s. per case. Close attention to packing in all instances should do much to overcome the big discrepancy in prices. Sydney prices were from 4s. to 10s.

In summing up the marketing situation one cannot but feel disappointed at the continued use of bags for sending apples all over the country for private orders. Secondhand cases would be just as cheap and much more effective for the safe carriage of the fruit.

Observations serve to show that well-packed fruit is much easier to sell than inferior packs.

It is again repeated that assistance in acquiring knowledge of the latest packing methods can be obtained free upon application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

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Progress of the Pig Industry

MURARRIE'S MILLIONTH PIG—TRIUMPH OF CO-OPERATIVE EFFORT.

ALTHOUGH it is not as yet possible to forecast when the second millionth pig will be slaughtered and treated at the Murarrie Bacon Factory, the Queensland Co-operative Bacon Association Limited has every reason to be proud of its achievement in disposing of the products of 1,000,000 pigs. The putting of the millionth pig through the usual process was the occasion early in April for the gathering together of 800 people representative of all sections of the producing interests and of the wholesale and retail trade.

His Excellency the Governor, Sir Leslie Wilson, in speaking at the luncheon, remarked that the auspicious treatment of such an honoured animal as the millionth pig was indeed an occasion for congratulation, especially as at that date the Association had been able to successfully dispose of all its products to advantage in this and other States and on overseas markets.

As an indication of the importance of the factory it may be remarked that for the year ended 30th June, 1935, no fewer than 86,590 pigs were treated at Murarrie, an average weekly handling of 1,665 pigs drawn from almost every district in Southern and portions of Central Queensland. During that period the average price paid for baconers was 4·72d. per lb., which compared more than favourably with prices paid in any part of Australia. Sales for that year amounted to £242,565. There are 5,041 shareholders, the total number of shares being 64,815.

The chairman of directors, Mr. J. A. Heading, presided at the gathering, and in the course of an interesting address said that the guiding principle of his Association was to give shareholders and the purchasing public a fair deal, and every effort had been made to bring the factory and depots up to date. They all took pride in the knowledge that the "Atlas" brand of pork products was well and favourably known throughout Australia, having won prizes at all the principal Royal and Royal National Shows in competition with the products of older established factories.

There had been, he said, a marked development in recent years, one instance being that for the year 1935, 33,240 more pigs were treated than in the preceding year and more than double the number received in

1933. A greater number of shareholders supplied the factory last year than ever before in the history of the Association, these results being achieved in the face of keener competition than during any previous period. Every one of the seventy trucking agents increased his truckings to the factory. The Sydney branch, which was opened in 1929, had a satisfactory year and sales made constitute a record. The export trade in frozen pork to the United Kingdom had also been developed, and from January, 1935, regular shipments of frozen pork had been made to the United Kingdom. Reports received from buyers are gratifying as to the way in which the pork had been placed on those markets. Eastern trade continued to expand steadily throughout the year, and their relations with agents throughout the East had been good, and they had expressed their satisfaction with the quality of the hams and bacon going forward.

For the twelve months ended June, 1935, more pigs were treated at Murarrie than had even been treated at any single bacon factory in Australia. Mr. Heading remarked that shareholders had every reason to be proud of their fine plant and the efficiency of the staff. "There is certainly no better anywhere," he added. "As a co-operative enterprise Murarrie has a splendid record, and in spite of all the changing conditions in recent years has come out year after year in a stronger and better position. To have increased the pig supply to 86,590 pigs, paid for them, treated and sold them, established a branch in Melbourne, and bought their Sydney premises was undoubtedly a good year's work."

The gathering of 800 people to witness the treatment of the millionth pig was another red letter day in the Association's history, and he believed it was the largest gathering of wholesale and retail traders that had ever assembled in Queensland.

Other speakers included the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, who congratulated the Association and gave a most interesting review of the development of the pig-raising industry; Hon. Digby Denham, who had officiated at the opening of the factory twenty-three years before; and Mr. R. G. Watson, Chairman of the Australian Pig Industry Council, and representative of pig producers of Australia on the Australian Meat Board.

After the luncheon, the visitors proceeded to watch the treatment of the millionth pig, a Large White grade of choicest quality. This honoured (!) pig passed successfully through the hands of the various butchers and was finally adjudged as entirely wholesome by the Government Slaughtering Inspector who had pleasure in affixing the approved health stamp on to the carcass.

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NOTICE TO SUBSCRIBERS.

If your Journal is enclosed in a yellow wrapper, it is an indication that your subscription has expired.

Kindly renew your subscription at once. Write your full name plainly, preferably in block letters.

Address your renewal of subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of February, 1936 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
		AUSTRALIAN ILLAWARRA SHORTHORNS.		
		MATURE COW (OVER 5 YEARS), STANDARD 350 LB.		
Penrhos Pansy	A. Sandilands, Wildash	17,603·31	844·13	Strathdu Admiration 2nd
Highfield Pink	J. A. Heading, Cloyna	10,744·5	425·243	Gloaming of Hill Top
Hillvale Jean 2nd	J. Weber, Peak Crossing	9,126·15	390·738	Drafter of Greyleigh
		SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.		
Sunnyside Honey 8th (365 days)	P. Moore, Wooroolin	13,085·6	504·054	Bruce of Avonel
		JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 370 LB.		
Home Hill Gertie II.	A. E. Althouse, Cloyna	8,528·18	291·223	Headlands Gordon
		SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.		
Homelea Duchess 8th	J. C. Savage, Humphrey	9,036·48	324·118	
Rosemount Jewel 10th	A. J. Bryce, Maleny	8.020·45	289·649	Rosemount Radiance
Plum of Alfa Vale (189 days)	W. H. Thompson, Nanango	6,880·65	263·635	General of Alfa Vale
		JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.		
Trevor Hill Bracelet	Geo. Gwynne, Umbiram	5,769·88	237·549	Viceroy of Wilga Vale
		JERSEY.		
		MATURE COW (OVER 4½ YEARS), STANDARD 350 LB.		
Midlands Melrose	Wallace Bishop, Kenmore	7,184·13	384·045	Oaklands Favourite Mascot

	SENIOR, 3 YEARS (OVER 3½ YEARS) STANDARD 290 LB.			
Glenview Sultanes Majesty	F. P. Fowler and Sons, Biggenden	9,355·61	516·909	Trinity Officer
Linwood Violet	D. Young, Kingaroy	6,314	373·064	Aerofoil of Banyule
Langside Thelma	G. W. Young, Inverlaw	5,524·7	305·422	Masterpiece Yeribee of Bruce Vale
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Wingate Bonnie	L. Pierce, Graceville	9,802·95	451·19	Meteor of Brooklands
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Pineview Margaret	T. Maurer, Darra	7,678·8	434·87	Oxford Buttercups Noble
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Brooklands Royal Lily	W. S. Conochie, Sherwood	7,403·4	407·353	Retford Earl Victor
Trinity Harmonys Dream	W. S. Kirby, Byrnestown	5,303·25	272·028	Trinity Dreaming Pioneer
College Duty	Queensland Agricultural High School and College, Gatton	5,397·09	271·009	College Chiefton
Langside Primel	G. W. Young, Inverlaw	5,218·45	260·666	Primrose of Langside
Bellgarth Rosalie II.	D. R. Hutton, Cunningham	5,012·5	249·116	Bellefaire Blondes Bellringer
Kenilworth Glory	H. T. Rowe, Kenilworth	4,560·8	248·129	Kenilworth Prince
Bellgarth Bonzanette	D. R. Hutton, Cunningham	4,840·93	238·076	Trecarne Renown 2nd

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week a ten minutes' talk, commencing at 7.5 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for May, June, July, and August, 1936:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 5th May, 1936.—"The Rural Assistance Board and its Functions," Mr. A. Gray, Agricultural Bank.

Thursday, 7th May, 1936.—"Pasture Mixtures," Mr. C. W. Winders, B.Sc.Agr., Assistant in Agronomy.

Tuesday, 12th May, 1936.—"The Rural Assistance Board and its Functions," Mr. A. Gray, Agricultural Bank.

Thursday, 14th May, 1936.—"The Economic Use of Licks in the Sheep-grazing Industry," Mr. J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 19th May, 1936.—"Pests of Seed Beds," Mr. J. A. Weddell, Entomologist.

Thursday, 21st May, 1936.—"The Prospects of the Fruitgrowing Industry in Queensland," Mr. H. Barnes, Director of Fruit Culture.

Tuesday, 26th May, 1936.—"The Suitability of Sheep-farming Areas," Mr. J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 28th May, 1936.—"The Value of New Cultivation for Cotton-growing," Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 2nd June, 1936.—"Fiji Disease in Southern Queensland," Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Thursday, 4th June, 1936.—"Pigs for Pork and Pigs for Bacon," Mr. L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 9th June, 1936.—"Some Peculiar Feeding Habits of Stock and what they Indicate," Mr. W. R. Winks, B.Sc., A.A.C.I., Analyst.

Thursday, 11th June, 1936.—"Cotton Varieties for Alluvial Soils," Mr. W. G. Wells, Director of Cotton Culture.

Tuesday, 16th June, 1936.—"Cotton Varieties for Hill Slopes," Mr. W. G. Wells, Director of Cotton Culture.

Thursday, 18th June, 1936.—"Artificial Incubation," Mr. J. J. McLachlan, F.B.S.A., Poultry Inspector.

Tuesday, 23rd June, 1936.—"Cane Irrigation," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Thursday, 25th June, 1936.—"Citrus Pruning in Queensland," Mr. R. L. Prest, Instructor in Fruit Culture.

Tuesday, 30th June, 1936.—"Transferring Bees," Mr. H. Hacker, F.R.E.S., Entomologist.

Thursday, 2nd July, 1936.—"Dategrowing in Queensland," Mr. H. J. Freeman, Senior Instructor in Fruit Culture.

Tuesday, 7th July, 1936.—"Interpretation of Labels attached to Stock Foods," Mr. R. A. Taylor, Inspector and Examiner, Fertilizers Branch.

Thursday, 9th July, 1936.—"The Giant Toad," Mr. A. F. Bell, M.Sc., Assistant Director, Bureau of Sugar Experiment Stations.

Tuesday, 14th July, 1936.—"Amended Regulations of the Dairy Produce Acts," Mr. G. B. Gallwey, Inspector of Accounts, Dairy Branch.

Thursday, 16th July, 1936.—"The Breeding of New Cane Varieties," Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Tuesday, 21st July, 1936.—"The Use of Drugs in the Treatment of Parasitic Worms," Dr. F. H. S. Roberts, Entomologist and Parasitologist.

Thursday, 23rd July, 1936.—"The Production of Choice Quality Cream," Mr. O. St. J. Kent, Dairy Research Laboratory.

Tuesday, 28th July, 1936.—"Fungi which Assist the Growth of Plants," Mr. H. E. Young, B.Sc.Agr., Assistant Plant Pathologist.

Thursday, 30th July, 1936.—"Herd Recording," Mr. L. Anderson, Dairy Instructor.

Tuesday, 4th August, 1936.—"A Plea for the Tree," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 6th August, 1936.—"Timber Trees on the Farm," Mr. W. D. Francis, Assistant Botanist.

Tuesday, 11th August, 1936.—"Rotation of Crops." Mr. H. W. Ball, Assistant Experimentalist.

Thursday, 13th August, 1936.—"The Problem of Prices," Mr. J. F. F. Reid, Editor of Publications.

Tuesday, 18th August, 1936.—"Some Ways of the Soil," Mr. J. L. Foran, Analyst.

Thursday, 20th August, 1936.—"Some Plants Poisonous to Poultry and Pigs," Mr. C. T. White, Government Botanist.

Tuesday, 25th August, 1936.—"Our Debt to Denmark," Mr. J. F. F. Reid, Editor of Publications.

Thursday, 27th August, 1936.—"The Tick Fever of Cattle in Queensland," Mr. C. R. Mulhearn, B.V.Sc., Government Veterinary Surgeon.

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Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Lotus or Birds' Foot Treefoil. English Oak.

W.A. (Maleny)—

The specimen represents a species of lotus or bird's foot trefoil. In the absence of flowers it is hard to be sure which actual species, but it looks like a form of the native *Lotus australis,* sometimes called bird's foot trefoil or Barwon River lucerne. It is very common in parts of the State, but like all species of lotus it contains a prussic-acid-yielding glucoside. In spite of this it is very readily eaten by stock, and losses occur principally among travelling animals or animals that gorge themselves on it on an empty stomach. It is an annual plant and will grow on land other than swamps.

The English oak should grow quite well at Maleny. The trees would reach a height of about 20 feet in your district in about ten years or perhaps a little less. There is only one variety, that is *Quercus robur*. It is not raised much by Brisbane nurserymen, but they would procure a plant for you, or failing that, you could write to Messrs. Hazelwood Bros., Epping, N.S.W.

General Notes

Staff Changes and Appointments.

Mr. A. J. Peberdy, Greenslopes, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. J. P. H. Clark, Inspector of Stock, Gladstone, has been appointed also an Inspector under the Diseases in Plants Acts.

Messrs. A. Kempnick and A. Wilson, Petches Creek, have been appointed honorary inspectors under the Diseases in Plants Acts.

Constable W. A. C. Zunker, Blackall, has been appointed also an Inspector under the Slaughtering Act.

Messrs. R. Evans and J. S. Pollard, Farleigh Sugar Mill, via Mackay, have been appointed millowners' representatives on the Farleigh Local Sugar Cane Prices Board, vice Messrs. W. B. Fordyce and John Smith, who have resigned on account of ill-health.

The Officer in Charge of Police, Wandoan, has been appointed also Acting Inspector of Stock.

Mr. W. G. Hancock, Banana Agent, Department of Agriculture and Stock, has been transferred from Gympie to Brisbane.

Mr. J. F. Whitby, Loader for the Committee of Direction of Fruit Marketing at Howard, has been appointed also an Honorary Inspector under the Diseases in Plants Acts.

Mr. J. M. Gibson, care of Racecourse Sugar Mill, Mackay, has been appointed Millowners' Representative on the Racecourse Local Sugar Cane Prices Board, in lieu of Mr. A. S. Hamilton, who has resigned.

Stallion Boards.

Under "*The Stallions Registration Acts*, 1923 *to* 1932," arrangements are now in progress for stallion parades in the various districts of the State to which the above Acts apply. The following have been appointed members of the stallion boards which will operate during those parades:—

Darling Downs North Stallion District.—Messrs. J. C. J. Maunder, B.V.Sc. (Chairman), W. C. Jeffrey (Miriam Vale), and J. H. Wall (Rockhampton).

Darling Downs South.—Messrs. A. F. S. Ohman, M.V.Sc. (Chairman), G. Elliot (Laidley South), and W. O. Scott (Taroom).

East Moreton.—Messrs. J. C. J. Maunder, B.V.Sc. (Chairman), W. Frood (Toowoomba), and R. J. F. O'Bryen (Toowoomba).

West Moreton.—Messrs. A. F. S. Ohman, M.V.Sc. (Chairman), W. Frood (Toowoomba), and R. J. F. O'Bryen (Toowoomba).

Wide Bay.—Messrs. P. F. A. Hardman, B.V.Sc. (Chairman), M. F. Yore (Logan Village), and H. S. Handley (Pampas).

Burnett.—Messrs. P. F. A. Hardman, B.V.Sc. (Chairman), M. F. Yore (Logan Village), and H. S. Handley (Pampas).

Central Coast.—Messrs. M. R. Irving, B.V.Sc. (Chairman), T. J. Turkington (Pilton), and G. H. Stokes (Toowoomba).

Northern Coast.—Messrs. M. R. Irving, B.V.Sc. (Chairman), R. G. Talbot (Ripplebrook, St. Lawrence), and W. A. Coady (Toowoomba).

Northern.—Messrs. A. L. Clay, B.V.Sc. (Chairman), G. Elliot (Laidley South), and A. V. Ralston (Clayfield, Brisbane).

The Dairy Products Stabilisation Board.

An Order in Council has been issued in pursuance of the provisions of "*The Dairy Products Stabilisation Act of* 1933," constituting the third Dairy Products Stabilisation Board, and appointing the members of the Butter and Cheese Boards and the Director of Marketing to be members of such Board, from the 1st May, 1936, to the 31st December, 1938.

Rural Topics

The Kicking Cow.

Kicking on the part of a milking cow may be a vice or it may be an excuse, and it is the business of all intelligent stock-handlers to find the true cause and, where possible, correct it. The fault may have some definite reason or it may be disposition. It is sufficient to have only a small skin crack on one's own hand or finger to realise the sensitiveness of the cow whose sore teat is being manipulated during the milking process. Where a cow in such a condition kicks out the action is instinctive and in self-defence. As soon as the careful herd manager sees to it that such cracks are healed up the kicking will cease. There is the type of cow whose make-up results in her kicking simply to relieve her own feelings. The animal showing signs of such a disposition must be treated at all costs with unruffled patience if she is to be turned into a contented milker. Such herd members are of the nervous, irritable sort, and if wrongly handled will become habitual kickers and a loss, so far as dairying profit is concerned. With a kicker of this type it is as often as not an effective plan to give at milking time a picking of some feed to which she is particularly partial to divert her attention from the pail-filling operation. Should this stratagem be ineffective and leg-roping be resorted to, all temptation to retributive violence on the part of the handler must be resisted, for harsh treatment in any form will increase the kicking propensity and lessen the chance of improving the kicker into a settled milking type. The cow that, despite all firm but kindly treatment, persists in the habit to an extent that suggests permanent viciousness should be disposed of in the same way as that decided on in the case of any other unsatisfactory milker—by being fattened up for sale to the butcher.—"The Australasian."

Husk-free Oats.

After nearly twenty years of research work on the part of English agriculturalists, the announcement was made a year ago that on a Norfolk farm the determination to breed an oat free from husk had at last met with success. During the past season the huskless oat has been cropped on a commercial scale so considerable as to make possible the sale offer of 3,000 cwt. of seed to farmers in other parts of the country. The new oat type is attracting widespread inquiry, and so extensive has been the application for trial lots that the originators, Messrs. Parker and Proctor, of Bakingley, King's Lynn, have stipulated that of the 3,000 cwt. they are willing to supply only 1½ cwt. (a sackful) is to be supplied to each applicant. The sowing recommendation is 45 lb. of seed to the acre, so that an area of 3⅓ acres can be sown by each farmer obtaining his supply. The cost of such added field experimentation is not low, for £12 a sack is the price of securing supply. Yields up to 40½ cwt. to the acre have been cropped by the new oats breeders on medium quality land, and the heavy crops are said to be exceptionally well supported on stiff straw of excellent quality. An important consequence of the development of the huskless oat that is anticipated is the making available as feed for poultry and pigs a cereal which, despite the rich food value of the oat kernel, has so far been little used on account of the preponderating quantity of husk coating present. The value of Sussex ground oats is well recognised, but the trouble and cost of grinding the husk has made the feed prohibitive except in small quantities. The fine oatmeal used to build up pig weaners had had similarly to be used sparingly. Should the huskless oat prove in general cropping to be all that is claimed for it the outcome in popularised farm and domestic use may be little short of revolutionary so far as farm practice is concerned.—"The Australasian."

Value of Native Birds.

At Wondai Shire Council meeting held recently, Councillor Outridge, speaking with regard to the campaign for preservation of native birds as endorsed at the preceding meeting, stated that at Brigooda the native birds were so plentiful that they effectively dealt with the recent caterpillar plague in that area without the farmers being put to trouble and expense. Councillor Porter stated that at Mondure the flocks of ibis had dealt with the grubs.—"The South Burnett Times."

Pedigree and Performance.

The real value of a pedigree is in its worth as a guide in the breeder's selection and mating problem, and therein it is indispensable. A "good" pedigree is not merely an imposing list of illustrious names, but is the record of sires and dams of proved individual quality and reproductive ability.—F.W.L. in "The Australasian."

Orchard Notes

JUNE.

THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly punctures, as there is always a percentage of damaged fruit which is liable to blue mould infection, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year; consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit-fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn-out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now where the land is ready and the trees are to hand, as early-planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyards ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress; otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

GIVE THE COW FAIR TREATMENT.

Sir Merrik Burrell, President of the Royal Agricultural Society (England), addressing a meeting of the Leicestershire and Rutland Milk Recording Society, issued a warning against imposing too great a strain on dairy cows. "The cow had to do much more than give milk if she were to be an economical animal," he said. "She had to retain her stamina and produce a calf each year." He went on to say that it would be madness to allow dairy cows to get into the condition so common in the poultry industry which aimed at getting the maximum egg yield at the expense of stamina, vitality, and lack of resistance to disease. Pedigree breeders should never lose sight of the utility points of dairy cattle. The problem of the proven bull bristled with difficulties. If a bull were not used until it were known whether he produced the right progeny six bulls would have to be kept, four of which would be idle. "My own experience," said Sir Merrik, "is that if a breeder had a really good bull and wanted to sell him when he was eight years or nine years old, he could not give him away." As many Australians are aware, Sir Merrik Burrell is a noted breeder of Red Polls.

Farm Notes

JUNE.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

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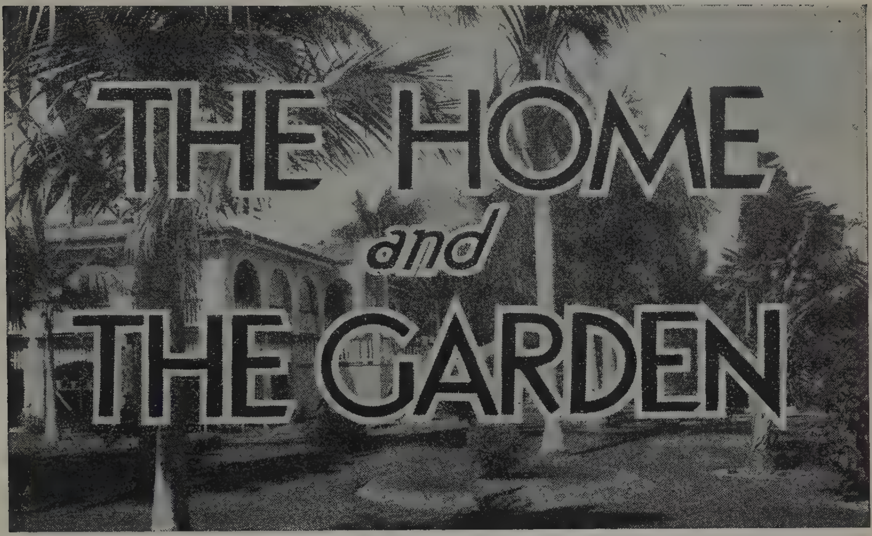

OUR BABIES.

> *Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.*

WHAT BECOMES OF THE BEAUTIFUL BABIES?

IT is many years since Patrick Geddes, the biologist, asked this question. He could not refrain from expressing his disappointment at the failure of so many human beings to reach the splendid possibilities with which they nearly all seemed to start. As he walked along city streets or wandered over the open country, he found everywhere boys and girls, men and women, young and old, who had fallen short of what they might have been.

In more recent years Sir Truby King, a name well known to most, repeated the same question. He asked, "As the crowd passes up and down the street before us, how many youths or adults of either sex could we pick out who would compare favourably as examples of human perfection with the beautiful babies, who are comparatively common?" He presses the question: How many would be entitled to 75 per cent. of marks, if judged by the following standard?—

1. Well-developed jaws and sound, good teeth.
2. Fully developed nose and throat, free from all restrictions or obstructions.
3. Fully developed chest with ample breathing capacity.
4. Sound digestive organs and freedom from indigestion.
5. Shapely, well-developed calves and feet, free from distortions and deformities.

In Truby King's opinion, our shortcomings are obvious even to the casual observer, yet for the most part people regard the present state of matters as normal. There is no general protest against human unfitness. So long as people can manage to struggle through their daily work with the help of occasional patchings-up by the doctor and the dentist, it does not occur to them that any higher standard than this is expected. Yet it is quite safe to say that, with few exceptions, the great majority of those who drag along with indifferent health, and who seldom feel perfectly well, strong, and fit, could have grown up excellent specimens of humanity had they been properly and sensibly reared. For the most part, men and women do not suffer from inevitable ill-health or unfitness, but from the results of a few easily avoidable daily transgressions of the laws of life. The main cause of modern bodily unfitness and inefficiency lies with our women, and is due, not to indifference on their part, but to lack of necessary knowledge and consequent failure to put into practice the laws of healthy living as regards themselves and their children.

And now to-day in this favoured land of Queensland we may usefully ask ourselves the same question: What becomes of our beautiful babies?

SUGGESTIONS FOR HOME STUDY.

Typewritten notes on various subjects will be available again this year from the Department of Tutorial Classes within the University of Queensland in Brisbane. On a variety of subjects there are sets of twenty-one papers. A fee of 8s. 6d. will enrol you for any one of these courses. The papers are posted two per fortnight over a period of twenty-one weeks. These fortnightly papers provide simple and helpful introductions to the subjects with which they deal. Books on the subject chosen can also be borrowed without extra charge.

Some of the subjects are of particular interest to farmers. One set of notes is concerned with horticulture and agriculture, and has been prepared by D. A. Herbert, D.Sc., of the University of Queensland. Another course on food and diet, and the scientific principles involved in correct feeding would be of interest to many of the women folk.

Many farmers are, nowadays, taking an increasing interest in economic and social affairs, and on these subjects they would find, among the courses provided, some of which would be very helpful in giving a basis of fact on which economic and social thinking can be built. There are special courses for the younger members of the family, such as elocution, composition, and essay writing.

Of very great utility to many who are not concerned with studying any particular subject, but who do like a good book in the evenings, would be the general library which is associated with the Department of Tutorial Classes. This library is available for use by post. A catalogue of all the books contained in it can be had from the Director, and books may then be borrowed three at a time for periods of three weeks. The library includes books of the better class fiction as well as books on most subjects about which people want to know something. Anyone interested should write to the Director of Tutorial Classes, corner of Edward and Ann streets, Brisbane, for information.

IN THE FARM GARDEN.

GREEN MANURE IN THE VEGETABLE GARDEN.

Where it is intended to commence the cultivation of vegetables during the spring this is the most important time of the year to make the preliminary preparations. As advised in earlier issues the laying out of the ground, digging and trenching are important operations which may be undertaken now. Green manuring is a most important and useful practice for bringing soil into good condition for sowing and planting in the spring, when almost any variety of vegetable may be grown. Green manuring offers a ready means of increasing the organic matter in the soil, and also of adding to the soil fertility. It is also the most useful means of suppressing weed growth and cleaning land for future cropping. It is generally recognised that legume-bearing plants are the most useful for green manuring. Field peas are very largely used. When plants belonging to the legume-bearing family are grown under suitable conditions, and the roots are attacked by bacteria in the soil which produce nodules upon the roots of the peas, the plants are capable of absorbing a considerable amount of nitrogen from the air, and thus the soil is enriched by this valuable plant food which is expensive to purchase in manures. But unless the nodule-forming bacteria are present in the soil the legume-bearing plants will draw from the soil the nitrogen they require for their growth, and the soil will be no richer in this element for their use.

If the land has not grown peas successfully before, it will pay to take a bushel or two of soil from a garden patch or field where peas have thrived, and sprinkle a small quantity of this soil along the drills where the peas are being sown. Another very useful legume for green manuring is the tick or horse bean. This plant resembles the broad bean, but the seeds are much smaller and are not used as a vegetable. The main object of a green manure crop is to obtain as much organic matter as possible for digging into the soil in the early spring. In this regard the horse bean is more valuable than the field pea. If it is necessary to inoculate land with nodule-forming bacteria for this crop, soil should be taken from a garden patch where broad beans have been grown successfully. There are different species of organism which produce nodules upon the roots of legume plants, and the bacteria which produce the nodules on the roots of peas will not similarly act upon the roots of beans. For general purposes a crop of Algerian oats or Cape barley is very satisfactory as a green manure crop. These cereals may be depended upon to give a good strong growth, providing ample bulk for digging into the soil. They also have the advantage that, not being related to any of the plants commonly grown in the garden, they are not subject to diseases which may be transferred to the vegetable crops to be grown later on. When sowing green-manure crops superphosphate should be used with the crop at the rate of 1½ to 2 oz. to the square yard. The use of the fertilizers will produce a greater bulk of green manure, and where the crop is dug into the ground the phosphates which have been absorbed by the crop will be liberated in the soil as the plants decay, and be made available in time for other plants to use.

DRAINAGE.

Drainage should be considered in relation to all types of soil, but especially heavy soils. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil; and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess water to run off with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upwards from this. In other cases it may only be necessary to feed the main trench from one side, while in others again main trenches may best be laid at the edges of the area and fed from the centre. These trenches may then be partially filled with broken stones, and the surface of the filling protected with a layer of tin or brushwood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones, if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

The depth of the drain depends on the class of soil, but it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 feet 6 inches to 3 feet is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on heavier land should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.

NITROGEN FOR THE GARDEN.

The most important and at the same time the most expensive element of plant food in garden soils is nitrogen. It is obtained in various forms, and the pea and clover family have the power of absorbing and assimilating to their own use the nitrogen of the atmosphere. It is for this reason that nitrogenous manures should not be applied, except in extreme cases, to beans or culinary or sweet peas. The four principal nitrogenous manures are sulphate of ammonia, nitrate of soda, nitrate of lime, and calcium cyanide of nitrolim. All are highly concentrated, and need to be used with the utmost care.

Nitrogen always stimulates the development of stem and foliage at the expense of flower and fruit or seed. If after excessive wet, or from some other cause, a plant appears to stand still, a small dose of nitrogenous manure will often stimulate it, and have a wonderful effect. On the other hand, a dose of a nitrogenous manure given when the plants are in flower or seed will often cause them to shed their flowers and fruit or seeds by causing an exuberance of growth of a soft, sappy nature.

KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

A REMINDER TO ONION GROWERS.

Onion seed growers should, by now, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1936 AND 1935, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1936.	Mar., 1935.
North Coast.	In.		In.	In.
Atherton	8·71	35	10·36	16·56
Cairns	18·20	54	12·76	34·36
Cardwell	15·53	64	21·16	16·97
Cooktown	15·27	60	14·48	34·57
Herberton	7·69	50	11·16	11·24
Ingham	15·39	44	28·51	17·79
Innisfail	26·36	55	24·96	46·46
Mossman Mill	18·02	23	19·39	28·74
Townsville	7·12	65	9·44	2·78
Central Coast.				
Ayr	6·30	49	12·33	3·10
Bowen	5·45	65	26·16	2·62
Charters Towers	3·64	54	7·33	1·35
Mackay	11·63	65	31·53	5·20
Proserpine	11·44	33	35·56	2·60
St. Lawrence	5·11	65	4·47	2·62
South Coast.				
Biggenden	3·64	37	4·06	1·66
Bundaberg	4·90	53	8·45	1·11
Brisbane	5·60	85	5·96	1·05
Caboolture	7·37	49	10·93	2·21
Childers	4·28	41	6·43	1·14
Crohamhurst	10·75	43	18·80	4·42
Esk	4·58	49	4·28	1·88
Gayndah	2·96	65	2·49	1·41
Gympie	6·00	66	7·83	2·57
Kilkivan	3·73	57	5·17	0·60
Maryborough	5·76	65	5·32	1·52
Nambour	8·86	40	14·34	4·65
Nanango	3·27	54	3·76	..
Rockhampton	4·30	65	5·10	1·49
Woodford	7·59	49	12·25	1·96

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1936.	Mar., 1935.
Central Highlands.	In.		In.	In.
Clermont	2·97	65	8·52	1·15
Gindie	2·42	37	..	0·05
Springsure	2·83	67	5·55	0·48
Darling Downs.				
Dalby	2·59	66	4·04	0·16
Emu Vale	2·24	40	1·70	0·55
Hermitage	1·97	30	..	0·40
Jimbour	2·43	48	2·63	0·62
Miles	2·55	51	5·15	0·16
Stanthorpe	2·56	63	4·47	0·19
Toowoomba	3·62	64	3·68	0·80
Warwick	2·42	71	1·92	0·49
Maranoa.				
Roma	2·49	62	7·05	..
State Farms, &c.				
Bungeworgorai	1·39	22	6·98	..
Gatton College	3·03	37	2·84	4·09
Kairi	8·39	22	11·63	19·03
Mackay Sugar Experiment Station	10·26	39	36·97	3·78

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MARCH, 1936.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Means at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·76	87	71	92	20	69	26, 27	1,448	18
Herberton	..	80	65	87	1	58	28	1,116	23
Rockhampton	29·88	83	70	96	2	64	30	510	19
Brisbane	30·01	79	66	88	2	61	27	596	15
Darling Downs.									
Dalby	29·96	82	62	92	1	53	5	404	8
Stanthorpe	..	74	57	84	29	45	28	447	15
Toowoomba	..	76	59	87	1	49	25	368	15
Mid-Interior.									
Georgetown	29·79	88	71	93	21, 22, 23, 24, 30	60	28, 29	1,319	17
Longreach	29·86	88	69	96	1	63	29, 30, 31	1,274	9
Mitchell	29·95	81	63	93	1	52	29	494	13
Western									
Burketown	29·78	89	75	93	2, 22, 23, 24	69	28	557	11
Boulia	29·84	88	70	94	1	64	27	322	8
Thargomindah	29·92	86	68	93	6	62	2, 25	222	4

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

					MOONRISE.	
	May, 1936.		June 1936.		May, 1936.	June, 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·18	5·20	6·37	5·2	2·4	2·7
2	6·18	5·19	6·37	5·2	2·34	2·45
3	6·19	5·18	6·38	5·2	3·5	3·23
4	6·20	5·17	6·38	5·2	3·35	4·8
5	6·20	5·17	6·39	5·2	4·9	4·58
6	6·21	5·16	6·39	5·2	4·47	5·52
7	6·21	5·15	6·39	5·2	5·25	6·49
8	6·22	5·14	6·40	5·2	6·13	7·51
9	6·23	5·14	6·40	5·3	7·4	8·51
10	6·23	5·13	6·40	5·3	7·58	9·54
11	6·24	5·12	6·41	5·3	8·57	10·55
12	6·24	5·11	6·41	5·3	9·57	11·57
13	6·25	5·11	6·41	5·3	10·59	..
						a.m.
14	6·26	5·10	6·42	5·3	12·0	12·57
15	6·26	5·10	6·42	5·3	..	2·4
					a.m.	
16	6·27	5·9	6·42	5·3	1·2	3·12
17	6·27	5·9	6·43	5·4	2·6	4·10
18	6·28	5·8	6·43	5·4	3·12	5·27
19	6·29	5·8	6·43	5·4	4·19	6·25
20	6·29	5·7	6·43	5·4	5·28	7·22
21	6·30	5·7	6·44	5·4	6·37	8·11
22	6·31	5·6	6·44	5·4	7·42	8·54
23	6·31	5·6	6·44	5·4	8·44	9·31
24	6·32	5·5	6·44	5·4	9·37	10·5
25	6·32	5·5	6·44	5·5	10·20	10·35
26	6·33	5·4	6·45	5·5	10·59	11·6
27	6·34	5·4	6·45	5·5	11·35	11·36
					p.m.	p.m.
28	6·34	5·3	6·45	5·5	12·5	12·7
29	6·35	5·3	6·45	5·5	12·35	12·42
30	6·35	5·2	6·45	5·5	1·5	1·19
31	6·36	5·2			1·35	

Phases of the Moon, Occultations, &c.

6 May,	○	Full Moon	1 1 a.m.
14 ,,	☽	Last Quarter	4 12 p.m.
21 ,,	●	New Moon	6 34 a.m.
28 ,,	☾	First Quarter	12 46 p.m.

Apogee, 3rd May, at 10.24 p.m.
Perigee, 19th May, at 12.36 p.m.
Apogee, 31st May, at 12.54 p.m.

On the 20th Mercury, in Taurus, will become apparently stationary, after which it will appear to move westward until the 14th of June.

On the 25th Neptune, in Leo, will also become stationary, changing its direction once more eastward.

On the 29th Mercury and Mars will be apparently in conjunction, Mercury being 2·2 degrees south of Mars, long after they have set in Queensland.

On the 31st Mercury will reach that part of its orbit which brings it between the Earth and the Sun and almost in a line with it—avoiding a transit by being 2 degrees north of the Sun.

Mercury sets at 6.21 p.m., 1 hour 1 minute after the Sun on the 1st, and at 6.18 p.m., 1 hour 8 minutes after it on the 15th.

Venus rises at 5.15 a.m., 1 hour 3 minutes before the Sun on the 1st, and at 5.29 a.m., 57 minutes before the Sun on the 15th.

Mars sets at 5.57 p.m., 37 minutes after the Sun on the 1st, and at 5.54 p.m., 34 minutes after it on the 15th.

Jupiter rises at 7.55 a.m. and sets at 9.45 p.m. on the 1st; on the 15th it rises at 6.56 a.m. and sets at 8.44 p.m.

Saturn rises at 2.23 a.m. and sets at 2.59 p.m. on the 1st; on the 15th it rises at 1.34 a.m. and sets at 2.6 p.m.

The path of the Moon, beginning at 8 p.m. on 1st May, will be as follows:—In Leo till the 2nd, in Virgo till the 5th, passing Spica on the 4th; in Libra till the 7th, passing Alpha Libri on the 6th; in Scorpio and Orphincus till the 10th, passing Jupiter. It will be in Sagittarius till the 12th, in Capricornus till the 14th, in Aquarius till the 16th, passing Saturn in Pisces till the 18th, in Aries till the 20th, passing Uranus near its western and Venus near its eastern border. It will pass through the great constellation Taurus from the 20th to 23rd, passing Mars on the west and Mercury on the east of the Hyades; through Gemini till the 25th, through Cancer till the 26th, through Leo till the 29th, passing Regulus on the 27th, and be again in Virgo till the 31st.

In May the Southern Cross will be visible soon after sunset and remain on the upper half of its circle round the south celestial pole until daylight.

5 June,	○	Full Moon	3 22 p.m.
12 ,,	☽	Last Quarter	10 5 p.m.
7 ,,	●	New Moon	3 14 p.m.
19 ,,	☾	First Quarter	5 22 a.m.

Perigee, 16th June, at 7 a.m.
Apogee, 28th June, at 6.36 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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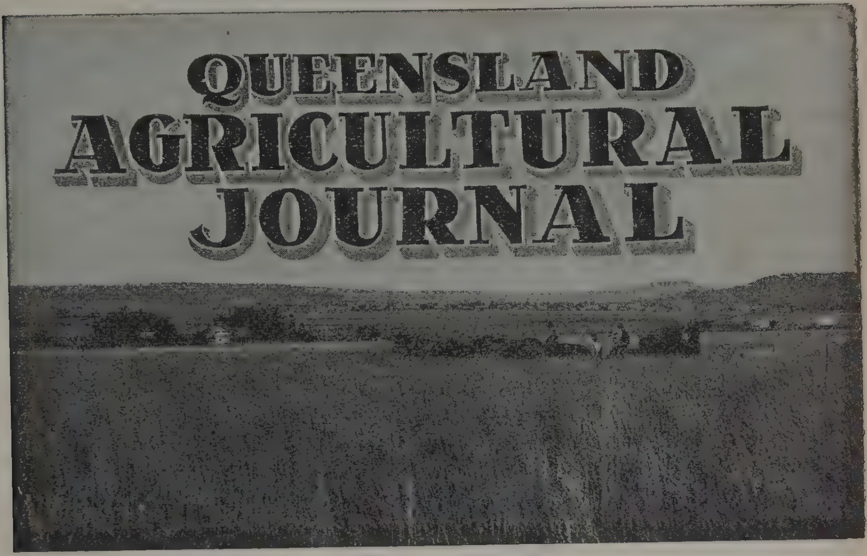

QUEENSLAND
AGRICULTURAL
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VOL. XLV. 1 JUNE, 1936. PART 6

Event and Comment

Markets and Population.

"WHATEVER may be said about Imperial policy, either now or in the past, I am satisfied that the greatest influence for peace and civilisation to-day is the British Commonwealth of Nations." With that remark the Premier, Hon. W. Forgan Smith, LL.D., M.L.A., prefaced a notable speech at a recent function given in his honour by the Royal Empire Society and the British Empire League in London. Sir Archibald Weigall, formerly Governor of South Australia, was in the chair.

The Premier added: "There are some people who talk of giving away what they are pleased to describe as their possessions. It is a very easy thing to give away that which you do not own. I am satisfied that the progress of the world depends on maintaining and strengthening that great Union to which we all belong."

Speaking of Queensland, Mr. Forgan Smith said that during the depression, price-levels fell, the drop amounting, in Australia, to £200,000,000 per annum. Financial crises took place, and they had to be tackled. The people of Australia had faced up to the position. They had solved many of their difficulties and they were on the high road to a return to prosperity. Considerable sacrifices had to be made, and they were borne by the whole community in proportion to their capacity to bear the burden. Their financial position was such that they could look forward to a steady return to normal conditions. Queensland, being chiefly an agricultural country, suffered less, probably, than the rest of the Commonwealth, and it was in the happy position to-day of having a smaller percentage of unemployment than other parts of the Commonwealth. The latest figures of normal employment showed that the problem was less acute in Queensland than elsewhere. That was the measure of their success in developmental projects.

In Australia, the Governments worked together on a public policy after having given full consideration to all its implications. The success of that policy laid down a few years age was amplified in 1932, and the recovery that had taken place in all the States was very evident at the present time.

Their immediate problems were markets and population. He took the view that, in the last analysis, the title of an individual to hold land was to be judged by the use to which he put it. The same principle applied to the territory held by a country. The only title to any country that history recognised was successful occupation, and Australia must have population in order that its development should be successfully continued and effective occupation accomplished.

The Australian population was 98 per cent. British. That was a factor the importance of which could not be over-estimated. And, with a reasonable policy carried out by the Australian and Imperial Governments, there was no reason to fear that this percentage could not be maintained. There was no reason at all, in the natural course, why the Commonwealth should not be peopled by our own stock; why we should not bring them out to a healthy climate where men, women, and children would be given the opportunity of developing themselves in the manner for which Nature had fitted them. There were two basic essentials—markets and population, population and markets.

It was necessary that we should come down to essentials before any remedy could be found. In discussing the problem of markets with many people in London, he found that there was a good deal of confusion of thought. Information had not been so widely distributed as it might have been. Australia was not competing with the farmers and producers of Great Britain. What it was doing was to compete with the farmers and producers of what were properly called foreign countries. It was not widely enough known that Australia purchased from Britain more than Argentina and Denmark put together. In considering matters of trade and two-way traffic, it was important that these factors should be clearly recognised. Australia was not willing to accept as a basis of negotiation that it should share equally the British market with foreign countries.

These matters had an important bearing on the problem of migration on the one hand and with population on the other. They required people of British stock, but it was illogical to talk of increasing the population of Australia by means of State-aided migration, and, at the same time, to speak of restricting the amount of exports it could send. The two things could not be reconciled.

It was a debtor country and must sell more than it bought if it was at all times to be able to meet its obligations, financial and otherwise. It had always met its obligations on the due day, but it must have the means of earning a livelihood so that it could go on meeting these payments.

A man on the land in Australia produced more than he could use himself, so that, in dealing with migration problems, one must take into account the problem of markets. Much confusion and difficulty had been caused in past years by people being misled, and therefore they wanted to provide the people of Great Britain with the facts. They wanted to be able to tell them that they would be able to look forward to a great future in a country like Australia. But they were not going to institute any scheme of mass migration unless they could be sure that this was beyond all possibility of misunderstanding. They wanted to be sure that the people of Great Britain had the facts—that if they were industrious and went to Australia their future would be reasonably assured. They must not forget the lessons of experience in deciding how migration was to be carried on.

The facts of existing price levels and the lack of purchasing power in Great Britain and in Europe must also be considered. A form of perverted nationalism had resulted in closing markets and restricting the channels of trade and commerce in the industrial countries of the world. These processes had greatly affected the market for certain commodities. There were countries in Europe which produced sugar, and they liked to think that they could share in the British free market. Owing to excise and other charges, the prices of sugar in Europe ranged up to 7½d. per lb. in English currency. Thus, the amount sold was kept low by the excessive price. The situation brought about by this form of economic nationalism was largely responsible for the friction and danger existing in the world to-day.

Those were the reasons why nations lacked confidence in one another. They were the fruitful causes of misunderstandings which led to war. Industrial changes and scientific developments had enabled us to produce to-day abundance of food which would not have been dreamed of thirty years ago. We must try to make these products available to the people of the world. Public policy should aim at a better distribution of this plenty as an aid to solving industrial and social problems and minimising the jealousies which concerned us all so much to-day.

The future of Queensland was assured. They intended to develop the country to the best of their ability. They were happy in the relations which existed between them and the sister States and other parts of the British Commonwealth of Nations. They wanted to work in co-operation with other members of that great family which was one in sentiment and objective.

Experiments with Vapours for the Control of Blue Mould of Tobacco.

By L. F. MANDELSON, B.Sc.Agr., Pathologist.

PATHOLOGISTS of the Council for Scientific and Industrial Research recently evolved a method for successfully protecting tobacco seedlings from blue mould infection, by growing them in covered seedbeds in which various liquids were vapourised. The most satisfactory results were obtained by using a concentration of benzol vapour produced by an area of liquid equal to two square inches per square foot of bed. Toluol and petrol were also investigated as evaporating materials. These experiments were carried out during the period 16th November, 1934, to 6th June, 1935. At an interstate conference on tobacco problems held in July, 1935, representatives of the various State Departments of Agriculture were invited to investigate the possibilities of this method for controlling blue mould under their local conditions.

Reports have indicated that benzol has been successfully tested in the various States, and in Western Australia satisfactory results were also obtained with petrol and "X3 solvent" when used at half the recommended strength. The object of this report is to discuss a series of three experiments which have been completed in Brisbane during 1936 to investigate this method of controlling blue mould.

In these experiments, the fungicidal efficiency of four materials—namely, benzol, toluol, "X3 solvent," and "X300 special boiling point spirit"—was investigated. Benzol is a commercial product containing benzene, toluene, xylene, &c., and is obtained from the distillation of coal tar and by scrubbing coke oven gas. It has a boiling point range from 70°C. to 98°C. Toluol is commercial toluene obtained from the distillation of coal tar, and may also be found in certain natural petroleums. The boiling point of toluene is 110°C. The other two materials are hydro-carbon distillates from crude oil, and were supplied by the Shell Company of Australia, Ltd.; "X3 solvent" has a distillation range of 100°C. to 120°C., and "X300 special boiling point spirit" from 150°C. to 185°C.

Details of Experiments.

In the first experiment tobacco seedlings were grown in ten cold-frames, five of which were covered with glass, and five with calico treated with linseed oil, and some were grown in open beds. The volatile materials tested were benzol and "X3 solvent," and were used at both "normal" and half "normal" concentrations. A "normal" concentration of vapour was considered as being produced by an area of liquid equal to two square inches per square foot of bed—i.e., where the area of the evaporating liquid was 1/72 of that of the bed. Two open beds were sprayed with colloidal copper with soft soap as a spreader. The other open beds, one glass-covered bed, and one calico-covered bed contained seedlings which received no treatment, and acted as controls for the experiment.

The liquids to be evaporated were poured into tin vessels of appropriate dimensions in the late afternoon, and the covers of the frames were then placed in position. In the morning the covers were

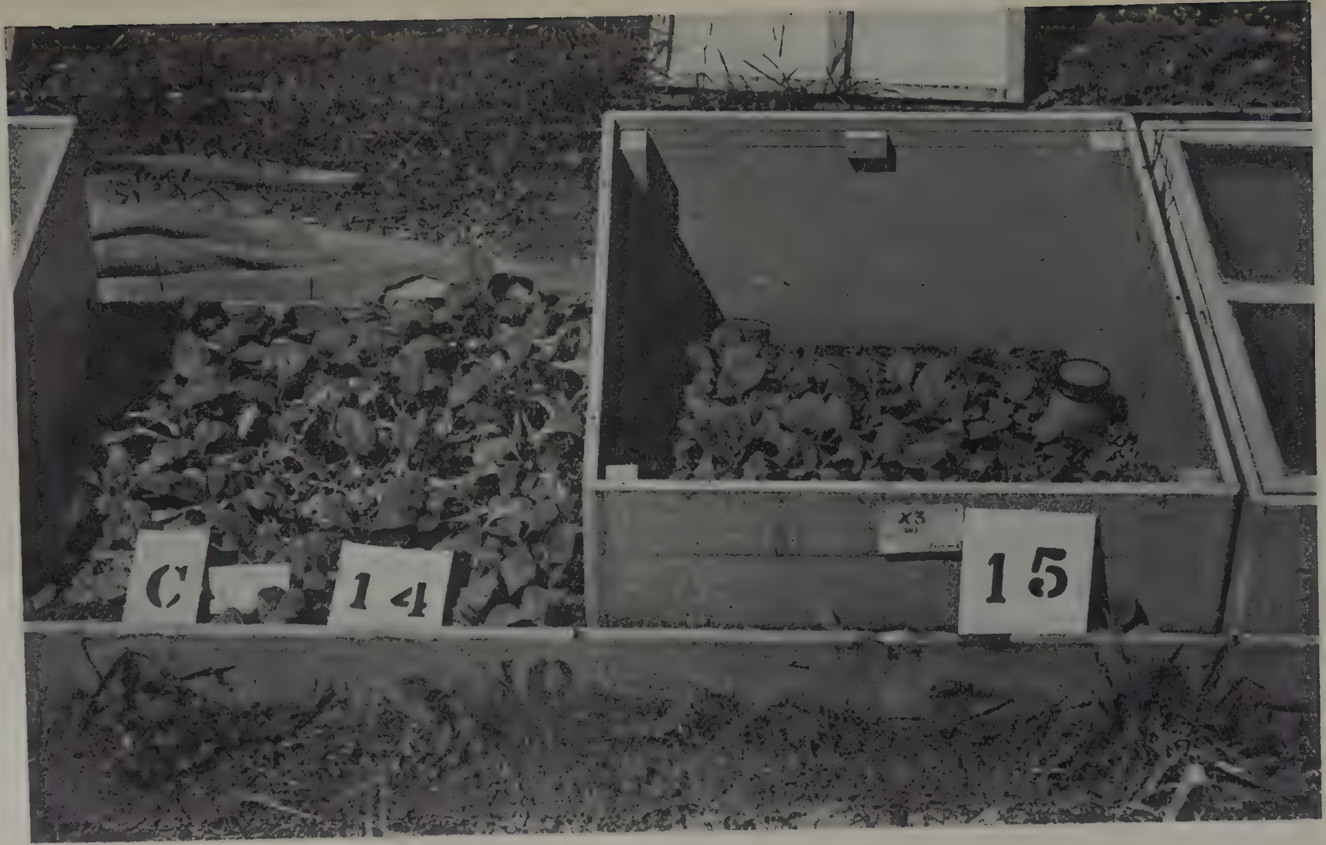

Plate 199.

Showing untreated plot on left affected with blue mould and plot treated with "X3 solvent" at a "normal" concentration on right. Note the healthy appearance of the latter. Tins used for evaporating the liquid may be seen in the cold-frame. The canvas cover for the frame may be seen in the background, and a glass cover may be seen in place on the adjoining frame.

taken off, the liquids were removed, and the amount which had evaporated was estimated. Maxima and minima temperature readings in both glass and calico-covered frames for the period the plants were exposed to the vapours were recorded, as well as the daily range in open beds. In order to introduce blue mould, a water suspension of spores of the causal fungus was sprinkled over the seedlings, and, subsequently, diseased plants were brushed over the beds.

Throughout the period of the experiment, beds treated with both benzol and "X3 solvent" at both "normal" and half "normal" concentrations remained entirely free from blue mould infection (Plate 199). At the higher concentration, seedlings were stunted and were rather pale. Growth was almost normal, however, at the lower concentration, and plants treated with "X3 solvent" made rather more satisfactory growth than those treated with benzol. At the termination of the experiment, plants sprayed with colloidal copper were only slightly affected with blue mould. All control plots at this time were affected, and seedlings in open beds suffered more damage than those in the cold-frames. In all cases, plants in calico-covered frames did not make as satisfactory growth as those grown under glass.

The object of the second experiment was to investigate the efficiency of benzol and toluol. The same equipment was used, and the experiment was conducted in a similar fashion to that of the first, with the exception that spraying with a fungicide was omitted. Furthermore, in addition to artificial infection, the seedlings were also exposed to natural infection with blue mould from the diseased survivors of the previous experiment.

Unfortunately, seedlings throughout the bed, both covered and uncovered, made very unsatisfactory growth; consequently, it was difficult to estimate the toxic effect of the two materials used at varying concentrations, or the effect of glass or calico covers. At the termination of the experiment, all plants in the open control beds had been killed by blue mould, and those in covered control frames were only slightly less affected. Plots treated with either benzol or toluol, however, remained free of the disease.

The third experiment was an attempt to control blue mould by vapour treatment, and at the same time reduce the initial cost of equipment and cost of operation. The volatile materials tested were benzol and "X300 special boiling point spirit," used at half the "normal" concentration. The latter was included owing to its relative cheapness, and benzol, which had proved effective in the previous tests, was useful as a check on its fungicidal value. A special type of vapour-tight tent was used in this experiment. Oiled calico with wooden rollers attached to its sides was supported by a strained wire running the length of the bed. The ends of the tent so made were blocked with a triangular-shaped piece of board to which the canvas could be attached by means of tapes. In order to admit ventilation or sunlight, the calico sides could be rolled up to any desired height and kept in position by means of pegs fitted into the sides of the triangular wooden ends (Plate 200). Two such tents, 15 feet by 3 feet 6 inches, were used for vapour treatment. A third tent of similar dimensions but without wooden ends was used as a control bed. Short strips at either end of the plot which were not covered and received no treatment served as additional controls.

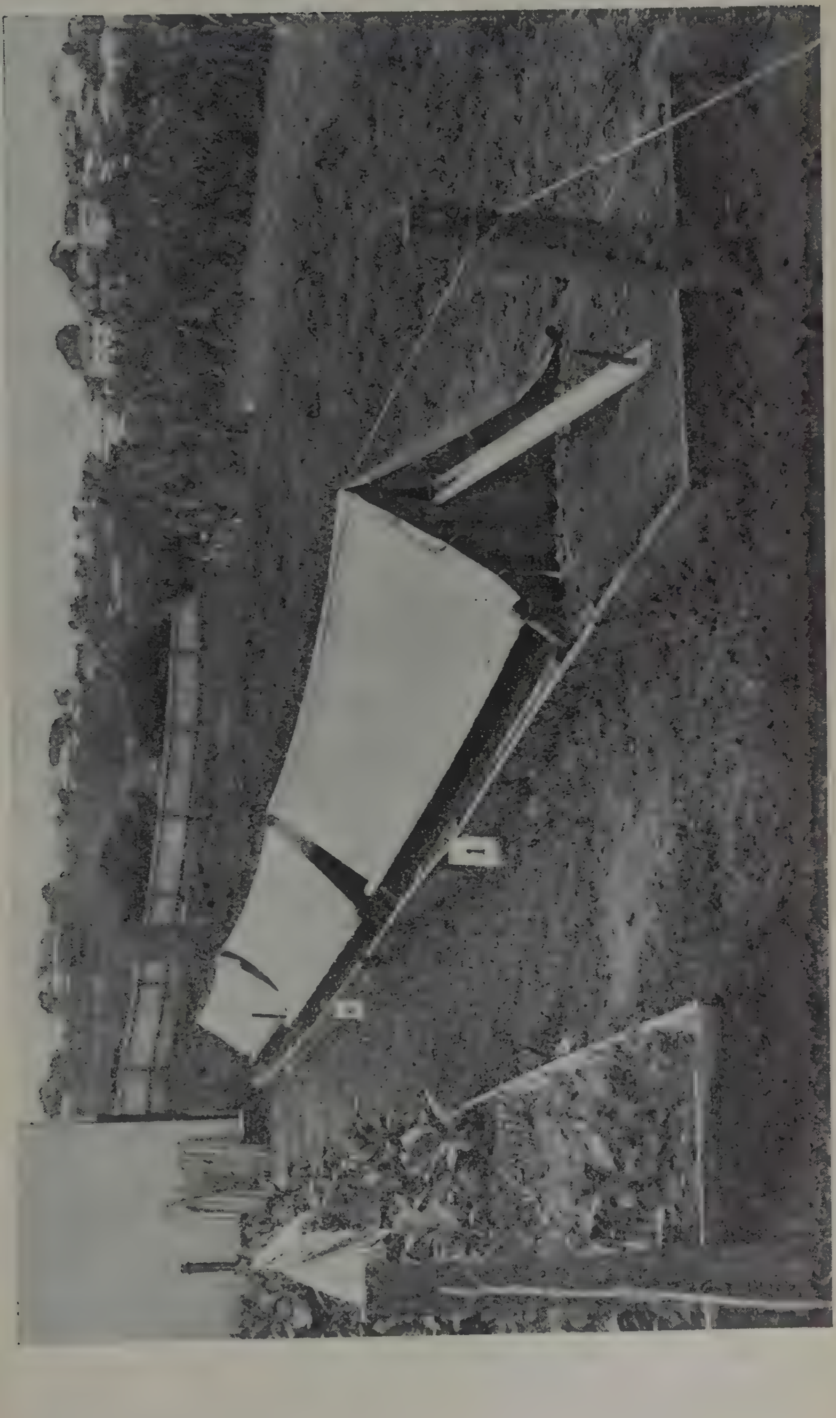

PLATE 200.

Showing type of vapour-tight calico tent used in the third experiment. One side of the tent is partly raised to permit aeration for the young seedlings. Note the tobacco plants in adjoining bed which acted as a source for natural infection.

It was found that seedlings in the control tent, possibly due to better aeration, made more satisfactory growth than those in the vapour-tight tents. At the conclusion of the experiment, plants in the control plots had been killed by blue mould. Those in both gas-treated plots remained free from the disease, but were rather spindly in growth. Plants treated with "X300 special boiling point spirit" were larger than those in the benzol-treated bed, and showed less vapour injury. However, in both cases a certain amount of vapour injury occurred in the vicinity of the evaporating vessels (Plate 201) and along one side of the bed. Furthermore, owing to the triangular construction of the ends, the slack calico sides had a tendency to rub on the soil and so kill young seedlings growing along the edge of the bed; consequently, if beds of this type were adopted in practice, it would be an improvement to have the walls of the bed perpendicular near the surface of the soil. This could be arranged by constructing a five-sided wooden end, which would make a ridge roof for the tent, and also permit the sides of the tent to hang perpendicularly. Furthermore, by arranging for the wooden rollers to overhang the earth supporting walls of the bed, less waste of seed-bed area would result.

Evaporation of Volatile Materials.

Benzol was used in the three experiments under discussion, and its rate of evaporation varied in each (Table I.). This variation was probably associated with differences in the temperature range during the period of the experiments, and also with the nature of the material used for the seed-bed covering, and the volume of the vapour-tight structures employed. The relative rate of evaporation of the other materials may be estimated by comparison with benzol in the respective experiments. It will be noted that this rate varied inversely with the boiling points of each. The actual cost of controlling blue mould by vapours largely depends on the rate at which the materials evaporate, as well as on the price of such materials.

TABLE I.

EVAPORATION OF MATERIALS.

Materials.	Period of Vapour Treatment.	Amount Evaporated.	Percentage Loss.
	Days.		
Experiment I. (in cold-frames)—			
Benzol (N and N/2)	22	10,950 c.c. (=19·3 pts.)	57·1
X3 solvent (N and N/2)	22	6,625 c.c. (=11·7 pts)	37·7
Experiment II. (in cold-frames)—			
Benzol (N and N/2)	23	14,185 c.c. (=24·9 pts.)	62·4
Toluol (N and N/2)	23	9,360 c.c. (=16·5 pts.)	42·3
Experiment III. (in calico tent)—			
Benzol (N/2)	29	18,480 c.c. (=32·5 pts.)	34·8
X300 special boiling point spirit ..	29	7,050 c.c. (=12·4 pts.)	14·2

(N="normal" and N/2="half normal" concentration of vapour respectively.)

Discussion.

From the results of these experiments, it appears that all four materials tested are equally effective in controlling the disease, both when used at a "normal" and a half "normal" concentration. Although some stunting of seedlings resulted when grown in these vapours, less

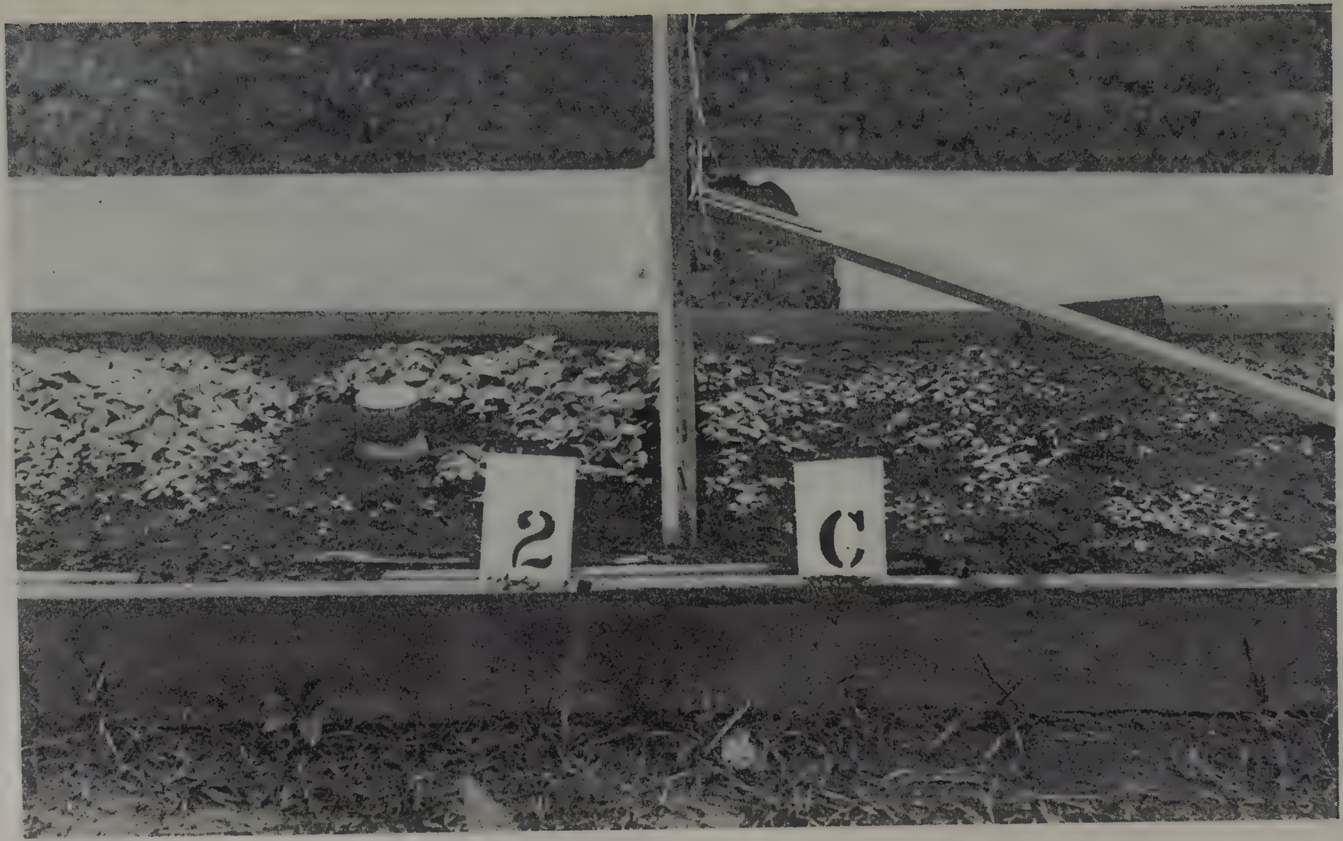

PLATE 201.

Showing plants in control tent (C) and in tent where "X300 special boiling point spirit" was used (2). All the plants in control plot are practically dead. Note the bare patch caused by vapour injury in the vicinity of the tin used for evaporating the liquid, and also the poor stand along the side due to injury from contact with sides of the tent and to the injury occurred with the lower concentration. The crude oil distillates "X3 solvent" and "X300 special boiling point spirit," furthermore, were less toxic than benzol to plant growth. No doubt the operating cost of controlling blue mould by vapour treatment could be considerably reduced by using a material such as "X300 special boiling point spirit" at the lower concentration.

A further economy could be effected by using a vapour-tight tent rather than the cold-frame type of seed-bed. The type described in this article could, no doubt, be considerably improved upon, and could be constructed relatively cheaply.

It is proposed to carry out further experiments at various tobacco centres during the approaching season, with the object of obtaining confirmation of the results discussed in this article. Readers who may consider using vapours for the purpose of controlling blue mould are reminded that they possess varying degrees of inflammability.

Acknowledgment.

The writer wishes to acknowledge the courtesy of the Shell Company of Australia, Ltd., in making available various volatile materials for these experiments. He is also indebted to various members of the pathological section of the Queensland Department of Agriculture and Stock for observations made on experimental plots during his absence from Brisbane.

PRIDE IN POSSESSION.

The slogan "Better Pigs on Every Farm," adopted by the Stud Pig Breeders' Society indicates a desirable objective and paves the way for progressive action. It is human nature to feel proud of one's possessions and attainments, and a farmer is (or should be) proud of his farm and of his stock. But how often he omits pigs as one of his possessions of which he is proud, and just as often he may overlook them in importance as profit earners.

While it is true, as emphasised by the National Pig Breeders' Association overseas, that pigs have justified the aphorism that they are "copper or gold" in times of general depression, it is surely worth while to have an interest in something which has a chance of bringing in gold than to be solely concerned in undertakings which ought to yield consistent profits, but which, owing to a great variety of circumstances, often fail to do so.

Pig production is a branch of agriculture with immense possibilities. Great Britain imports annually over £40,000,000 worth of pig products, of which, until quite recently, Australia contributed nothing at all. The industry is growing and prospects are good, but better quality is required if we are to maintain our position as exporters and receive the maximum profits.

It is sound business to buy purebred pigs even if the purchaser has no intention of becoming an exhibitor of pedigreed stock, for the purchaser of purebred pigs will derive satisfaction and pleasure from the ownership of those better quality animals, especially if, in addition to purchasing them he gives them that added care and attention which are essential to success.

There are several British breeds of pigs in which farmers generally should be specially interested—the Berkshire, the Large White, the Tamworth, and the Middle White. The breeding and feeding of purebred animals are actually less costly than the breeding of other types of pigs, while there is no reason why the profits should not be materially higher. "Pigs for profit, and better pigs on every farm," should be the slogan adopted by every farmer.—E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

The Tobacco-growing Industry in the United States of America.

W.M.V

By L. F. MANDELSON, B.Sc.Agr., Plant Pathologist.

[*Continued from May, 1936.*]

Cultural Practices.

FARMING methods vary greatly in different parts of the flue-cured belt, due partly to local conditions such as soil and climate, and the nature of other crops grown on tobacco farms, the type of labour employed, and the farming traditions of individual areas. Some States, such as Georgia and South Carolina, have only been growing tobacco for a relatively short period, and in such areas new methods are more quickly adopted, and farming tends to be of a more progressive nature. The methods adopted in the Piedmont or Old Belt of North Carolina and Virginia, vary somewhat from those of the New Belt, situated on the Coastal Plain extending from North Carolina, through South Carolina and Georgia into Northern Florida. The former is hilly country with a great diversity of soil types, whereas the latter is fairly uniformly flat, with a poor sandy loam soil.

PLATE 202.

CHOPPING DOWN TOBACCO STALKS.—At the termination of the season tobacco stalks are frequently chopped down with a stalk-cutter. This implement is shown in operation in North Carolina.

Soil Preparation.

After harvest in the Piedmont area, the old tobacco stalks are usually chopped down with an implement known as a stalk cutter (Plate 202), and the hills are ploughed down in the direction of the rows. The soil is then cultivated with a disc cultivator. Rye is planted in the autumn, and the crop is ploughed in when knee high about seven months later. Such a cover crop is very desirable in this section to prevent erosion, and to improve the condition of the soil which is frequently of

PLATE 203.

TOBACCO FIELD PREPARED FOR FERTILIZER APPLICATION.—A tobacco field in Georgia showing where rows have been opened up with a shovel plough preparatory to applying fertilizer.

PLATE 204.

APPLYING FERTILIZER.—In the foreground fertilizer is being applied with a distributor. The team in the background with a small shovel plough, follows on and incorporates the fertilizer with the soil. The soil is an extremely heavy type in the Piedmont section of North Carolina.

PLATE 205.

INCORPORATING FERTILIZER WITH THE SOIL.—After the fertilizer has been applied to the opened drills it is thoroughly mixed with the soil by means of a small shovel plough.

PLATE 206.

"LISTING" OVER THE FERTILIZER DRILL.—After the fertilizer has been applied and mixed with the soil, a ridge is made over it by two furrows with a turning plough. The operation is known as "listing."

a heavy nature. It also mitigates losses by leaching, which may be considerable between tobacco crops. Lysemiter studies at the Virginia Polytechnic Institute have indicated that 48 lb. of nitrogen may be lost between October and March, whereas where rye was grown, only $1\frac{4}{7}$ lb of nitrogen were lost.

After the soil has been worked up into a good tilth, drills are opened up with a shovel plough (Plate 203), and fertilizer is applied with a distributor (Plate 204). A smaller shovel plough is then used to thoroughly incorporate the fertilizer with the soil (Plate 205). The hills are eventually ''listed'' by making a furrow with a turning plough on either side of the drill (Plate 206). In the Winston-Salem section where the soil is rather rich, only very small ridges are made, and an almost flat method of cultivation is practised. This method, which is not typical of the belt, is possibly adopted to discourage root development, and prolonged growth on this soil type.

PLATE 207.

A ''DRAG'' FOR SMOOTHING OFF TOBACCO HILLS.—The usual type of ''drag'' consisting of a couple of logs, used for smoothing the tops off tobacco hills prior to setting plants in the field.

Prior to setting the plants in the field, the tops of the hills are at times smoothed off almost to the original level of the ground, by drawing a heavy board or log down a couple of rows at a time (Plate 207). More frequently in the Piedmont area, the position in the row where each plant is to be set is firmed (''patted''), or the top of the ridge is dragged off (''brushed'') with a hoe, according to the moisture content and texture of the soil. In Virginia a method peculiar to that district is to pull a ''drag,'' consisting of four boards or runners, across the rows (Plate 208), and so make four depressions where plants are to be set in each row in one operation. A simple method sometimes adopted is for a farm labourer to walk along the top of each row and so mark the position for each plant with his feet. On heavy soils which tend to form clods, a ''Climax'' harrow (Plate 209), which is a metal implement specially constructed for clod breaking, is run down the rows. In some cases, plants are set in the rows without any preliminary smoothing of the ridges.

The object of smoothing down the hills or setting plants in depressions is to encourage early and rapid growth of the plants, or in some cases, to afford young plants some protection from winds. On light soils particularly, it firms the bed and so encourages capillarity and the presence of moisture near the roots of the young plants. Furthermore, by starting with a low hill, each cultivation tends to build up the soil about the plants, and this encourages the development of adventitious roots which increases the plants' feeding surface, tends to control root rots and nematod injury, and is generally beneficial.

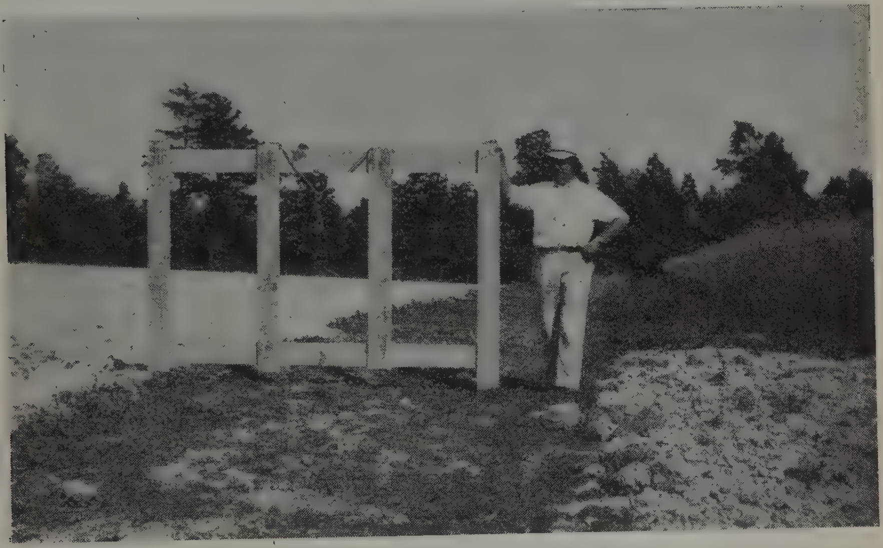

PLATE 208.

A TYPE OF "DRAG" USED IN VIRGINIA.—Showing the type of "drag" used in Virginia. It is run across the rows and makes four depressions where plants are set in each row.

When the plants are set with horse-drawn machines (Plate 210), the "middles," or the soil between the rows is ploughed out, so as to make a wide bed to support the machine. In any case, the most progressive farmers plough out the "middles" as soon as possible after setting, so as to allow adequate drainage for the hills.

A makeshift method of preparing the land, sometimes adopted when farming operations have been delayed by unfavourable weather conditions, consists of "re-bedding." In this case, the original rows are left standing after the crop has been harvested, until the following spring. Fertilizer is then placed in the furrows between the rows, and covered by ploughing down the old rows on either side with a turning-plough. The new hills or beds are subsequently made where the old furrows originally existed.

In the Piedmont area, where soil erosion is becoming an increasingly serious problem, special precautions have to be taken with row cultivated crops (Plate 211). On steep hillsides, tobacco rows are made at right

PLATE 209.

"CLIMAX" HARROW.—"Climax" harrow being used to break down clods on heavy soil in North Carolina. It consists of a number of curved metal bars which are drawn along the tobacco rows.

PLATE 210.

PLANTING MACHINE AND "DRAG."—Showing a planting machine in operation in North Carolina. In the right foreground may be seen a log which is used as a drag for smoothing down tobacco hills.

PLATE 211.

EROSION PREVENTION.—A newly planted tobacco field in the Piedmont section of North Carolina. Note the grass-covered earth banks or terraces across the field, erected to mitigate washing of the soil in hilly country.

angles to the direction of greatest slope, and hence follow the contour of the field. Earth banks, or terraces, are also erected parallel to the rows. They are not cultivated, and are allowed to become covered with grass and other vegetation in order to mitigate washing of the soil.

In the New Belt, the best practice is to break up the soil in the autumn or winter in order to facilitate the decay of vegetable matter, and generally "sweeten" the soil. As in the Piedmont, fertilizer is applied in a drill, and is incorporated in the soil with a shovel plough, and beds are subsequently "listed" over the fertilizer with a turning plough. Possibly more care is given to obtaining a uniform distance

PLATE 212.

MARKING OUT TOBACCO ROWS.—A mule-drawn wooden marker in use in Georgia. Four parallel rows are thus marked in one operation.

between the rows and between plants than in the Old Belt. At times a mule-drawn wooden marker (Plate 212) is drawn over the field, which marks the position for four or five drills in one operation. After the beds have been made, the positions where the plants are to be set is sometimes marked by running a spiked wheel down the rows, or by

PLATE 213.

MARKING POSITIONS FOR PLANT SETTING.—A wooden marker in use on experimental plots in Georgia. Various devices are used for setting plants at regular distances apart in the rows to ensure even development of the plants.

PLATE 214.

"LIFTING" TOBACCO PLANTS.—Seedlings being removed from a seed-bed in North Carolina for transplanting in the field. Note the tomato plants growing around the border of the bed.

other devices (Plate 213). Such practices tend to ensure even development of individual plants. In many cases, of course, judgment alone is used in marking out the rows and spacing the plants. The practice of smoothing off the tops of the rows is fairly general; nevertheless, where the soil has been reduced to a very fine tilth, the smoothing procedure is not considered so necessary.

PLATE 215.

SETTING TOBACCO BY HAND.—Hand setting a field of tobacco in North Carolina. Note the mule team with barrels of water and water being poured around the newly set plants.

PLATE 216.

SETTING TOBACCO BY HAND.—A large gang of workers setting tobacco under shade in Florida. Water and plants are carried ahead of the party in a wagon, and a remarkably extensive area can be planted up in a day in this fashion.

Planting.

With the approach of spring, the tobacco plants are pulled (Plate 214) from the beds and set in the field.

Most of the crop is set by hand (Plates 215 and 216). During periods of showery weather, labourers dibble the plants into the hills with short pegs, and firm the soil about them. Should it be considered that there is insufficient moisture in the soil or during dry periods, hand watering is employed. Successful hand setting depends largely on the skill of the workmen, and not infrequently variations in the "stand" of plants in rows set by different labourers can readily be observed. Mule-drawn planting machines are more generally employed in the Old Belt than on the Coastal Plain. They make it possible to plant the crop with great rapidity, and may conveniently be used in dry weather, since they automatically water the plants while setting them in the soil. A small hand implement, known as the "Masters Plant Setter" (Plate 217), is becoming increasingly popular in the tobacco areas, and quite a large proportion of the crop, particularly in the New Belt, is being planted with it. It consists of a vertical cylinder to contain water, and a side tube large enough to take a tobacco seedling. The operator digs the nose of the machine into the soil, an assistant drops a plant down the side tube, and by operating a control at the top of the machine, a small quantity of water is released and soil is drawn about the plant. The machine has many advantages over other methods, such as low capital cost, ease in operation, and adaptability during dry weather, or on uneven ground. It tends to ensure regularity of stand, and hence is particularly desirable in experimental work (Plate 218).

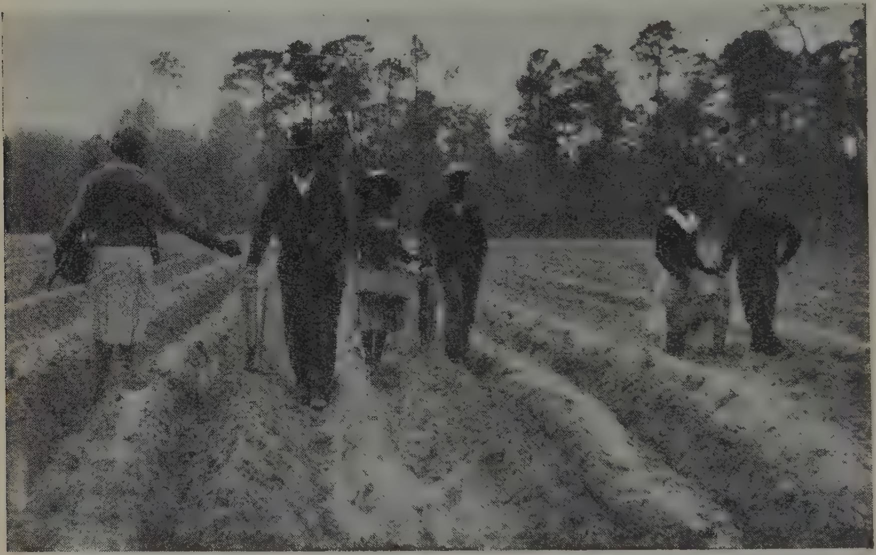

PLATE 217.

SETTING BY HAND MACHINE.—"Masters Plant Setters" in operation in South Carolina. An assistant drops a seedling down a side tube and the operator by actuating a lever releases a small quantity of water about the plant in the soil.

The distance between plants as well as the space between rows varies with soil types and with individual farmers. The rows are usually 3½ feet to 4 feet apart, and the plants are set 20 inches to 30 inches in the row. On very fertile soil, however, they may be set as close as 18 inches between plants. As a generalisation, it may be said that plants are set about 2 feet apart, and the distance between rows is 4 feet.

The correct time for setting plants in the field is of considerable importance. If set too early, plants tend to develop leaves which are heavy, coarse, and undersized. If set too late, unfavourable weather conditions at the latter part of the season may result in the unsatisfactory ripening of the crop. In the established tobacco growing areas in the United States, farmers definitely know the most satisfactory time, to within a few days, for setting the crop in their own districts. Consequently, the dates when crops will be set and harvested are well established, and these operations proceed as the warm weather progresses from South to North.

PLATE 218.

HAND SETTERS IN USE FOR EXPERIMENTAL WORK.—Setting a tobacco field experiment at the Coastal Plain Experiment Station in Georgia. Two men following the planters firm the soil to facilitate an even stand. Note how the tops of the hills have been smoothed off almost to soil level and the positions for the plants marked. The plants are not covered or hooded after being set in the field.

Plants are not "hooded" or protected with paper or any such material after being set in the field (Plate 218).

Fertilizers.

Tobacco fertilizer formulæ, the sources of plant food to be used in them, rates of application for various soil types, and methods of fertilizer application have been extensively investigated in the United States. At a tobacco conference held in Virginia last year, specialists from various parts of the flue-cured belt discussed their investigations in this field, and as a result of their discussions, made official recommendations for fertilizers for the 1936 bright flue-cured tobacco crop. They may be briefly summarised as follows:—

(1) *For Heavy or More Productive Soils.*—700 to 800 pounds per acre of 3-10-6. (These figures represent percentages of total nitrogen, available phosphoric acid, and potash respectively, in the fertilizer mixture.)

(2) *For Light or Less Productive Soils.*—800 to 1,000 pounds per acre of 3-8-6.

PLATE 219.

A LOW SULPHUR FERTILIZER EXPERIMENT.—A mature crop in South Carolina where fertilizer ingredients low in sulphur had been applied.

Where high topping is practised and heavy yields are expected, the potash content may be increased to 8 per cent. or 10 per cent. with profitable results. It was further recommended that the fertilizer should be mixed thoroughly with the soil in the row before ridging or applied in bands at the side of the rows, and that it should be applied ten days before setting plants whenever practicable.

Sources of Plant Food.

1. *Nitrogen.*—One-third of the nitrogen should be derived from high-grade organic materials of plant or animal origin (e.g., cottonseed meal, fish scrap, animal tankage, &c.); one-third from materials supplying nitrogen in the nitrate form; and one-third from urea and/or standard inorganic sources of nitrogen. Not less than a quarter of the nitrogen should be water soluble.

2. *Phosphoric Acid.*—To be derived from superphosphate, double (also called treble), superphosphate, and/or dicalcium phosphate.

3. *Potash.*—To be derived from any source of available potash, provided the chlorine content of the mixed fertilizers so compounded

does not exceed 2 per cent. Where tobacco by-products are used, they must be sterilized to kill any disease organisms which may be present.

4. *Magnesia.*—It is recommended that fertilizers carry 2 per cent. magnesia (MgO), at least one-half of which shall be derived from water soluble materials, or shall be water soluble in the mixed fertilizer.

5. *Chlorine.*—Fertilizer mixtures should contain 2 per cent. chlorine. It has been found that small quantities of chlorine increase the acre value of the crop, but an excessive amount injures growth, reduces quality, and has an unfavourable effect on the burning quality of the cured leaf.

PLATE 220.

SIDE HARROWS.—Showing wooden side harrows, an implement frequently used in the flue-cured belt for breaking the crust of the soil after plants are established in the field.

6. *Sulphur.*—Fertilizers should contain a minimum quantity of sulphur, preferably by reducing the more soluble sulphur compounds used in the fertilizer. Recent experiments have indicated that maturity is delayed, and the colour of the cured leaves has a tendency to be red when large quantities of sulphur are included in the fertilizer mixtures.

7. *Calcium.*—Fertilizers should carry in an available form, a minimum of 6 per cent. of calcium oxide (CaO) equivalent. This recommendation becomes necessary as a result of the present tendency to substitute high analysis materials, often low in calcium, for superphosphate.

It was further recommended that dolomitic limestone should be used as a neutralising agent for non-acid fertilizers, since it contains both magnesia and calcium, which are important plant food materials.

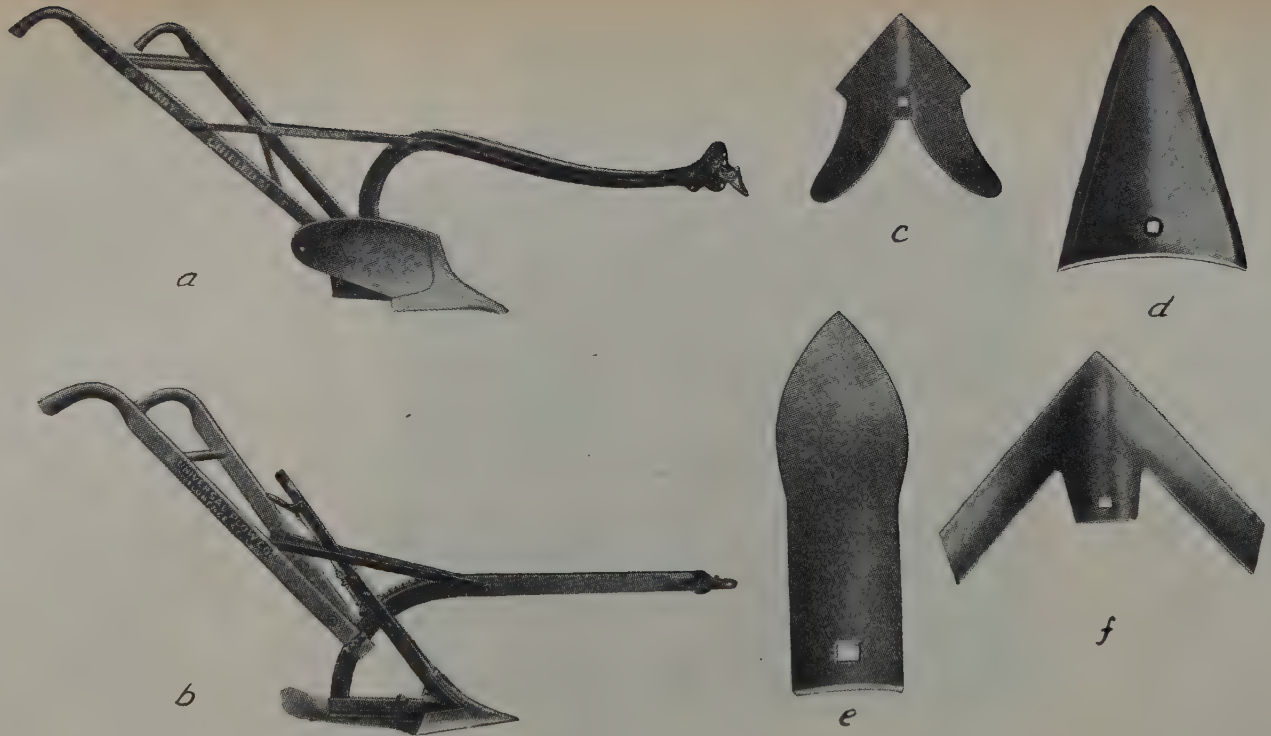

PLATE 221.

IMPLEMENTS.—Farm implements in general use in the flue-cured tobacco areas. (*a*) Turning plough; (*b*) Sweep stock with wing sweep attached; (*c*) Middle-burster blade; (*d*) Shovel plough blade; (*e*) Bull tongue blade; (*f*) Wing sweep blade. The dimensions of the various implements vary for different operations. Large and small shovel ploughs are used for marking out the fertilizer drill and mixing the fertilizer with the soil respectively. Large and small "wings" or mouldboards are also attached to the turning plough for different stages of plough cultivation. The sweep is the most generally used implement and is used both for stirring the soil and cleaning out the middles of the furrows.

The above recommendations are merely suggestions based on many years experience and experimentation as to the best procedure for fertilizer applications for tobacco, and they do not indicate the general practice of tobacco farmers in the flue-cured belt. Probably the 3-8-3 formula is still most generally used in North Carolina, and the usual application is about 1,000 lb. per acre on the lighter soils. In regard to sources of plant foods, the following may be taken as a rough generalization:—Nitrogen is derived from 25 per cent. cotton seed meal, 25 per cent. from dried blood, fish scrap, tankage, &c., 25 per cent. from nitrate of soda, and 25 per cent. from ammonium sulphate. The phosphoric acid is derived from superphosphate. The potash from muriate of potash and sulphate of potash, or sulphate of potash-magnesia. It must be remembered, however, that there is a tremendous variation in fertilizer formulæ and ingredients used. There is undoubtedly a tendency at present to increase the percentage of potash in tobacco fertilizer mixtures, and 5 per cent. potash is now fairly generally used in the more southern states.

PLATE 222.

CULTIVATING WITH A "SWEEP."—Shallow cultivation with a "sweep" is the general practice in the Southern tobacco-growing States. Alternate rows are cultivated weekly in this fashion.

The suggestion of lowering the sulphur content of fertilizers is of very recent origin, but there are already indications that it will be generally adopted in due course. In recent experiments, nitrate of potash has been substituted for sulphate of potash, and superphosphate by other high analysis phosphates with a low sulphur content, and the results have been satisfactory (Plate 219). There appear to be some points of resemblance between sulphur and nitrogen nutrition. An excess of either results in a heavy leaf, which does not yellow readily, and a deficiency causes chlorosis. A lack of sulphur, however, is not associated with "firing" around the margin of the leaf as with nitrogen deficiency, and the chlorotic symptoms tend to disappear after rain.

The use of lime was at one time recommended for tobacco soils, but it is now considered definitely detrimental. The best quality leaf is grown on soil with an acid reaction. The excessive use of lime tends to make soils alkaline, adversely affects the quality of the leaf, and permits the development of black root rot. Liming may at first tend to increase yield, but the final result is to more or less permanently reduce the usefulness of the soil for tobacco culture.

Well-rotted horse manure has been found to be a very desirable form of nitrogen, as it produces a smooth, good quality leaf. It is frequently used at the rate of 2 or 3 tons per acre, irrespective of the amount of artificial fertilizer applied, and would probably be used more extensively if it were available. The usual practice, when moderate quantities are applied, is to drill it in rows and hill it over some ten or fourteen days prior to the applications of fertilizers.

PLATE 223.

YOUNG TOBACCO READY FOR THE FIRST CULTIVATION.—A field of young tobacco which has just commenced to make growth.

Cultivation.

Cultivation methods vary somewhat in different areas in the flue-cured belt. The most usual practice, however, is to break the crust after the plants are established with a small-toothed cultivator or "side-harrows," which is an implement with tines set diagonally to the direction in which it is drawn (Plate 220), and to chip between the plants with a hoe. Subsequently, shallow cultivation is practised once a week between alternate rows with a "wing sweep" (Plate 222), the soil between the rows being traversed three or four times to complete the cultivation. The "sweep" is a shallow ploughing implement (Plate 221) with a broad, arrow-shaped blade which is used extensively in the South for row-cultivated crops such as cotton and corn. After the crop has been six or eight weeks in the field, a somewhat wider bed is made with the sweep, and cultivation ceases. The crop is then said to be "laid by."

In the early days of tobacco cultivation the plough was more extensively used for working this crop, and is still used to some extent in the Old Belt. However, with the extension of tobacco-growing into the Coastal Plain, the methods used there for the cultivation of cotton were applied to tobacco culture as well. The "sweep" method of cultivation, which is shallow and does not develop a very broad bed, is largely dependent on favourable weather conditions for success. Consequently, there has been a tendency in recent years to re-introduce the single-furrow turning plough (Plate 221), for crop cultivation. Plough cultivation is at present being strongly advocated in South Carolina. The method appears to have many distinct advantages, and hence will be discussed in some detail.

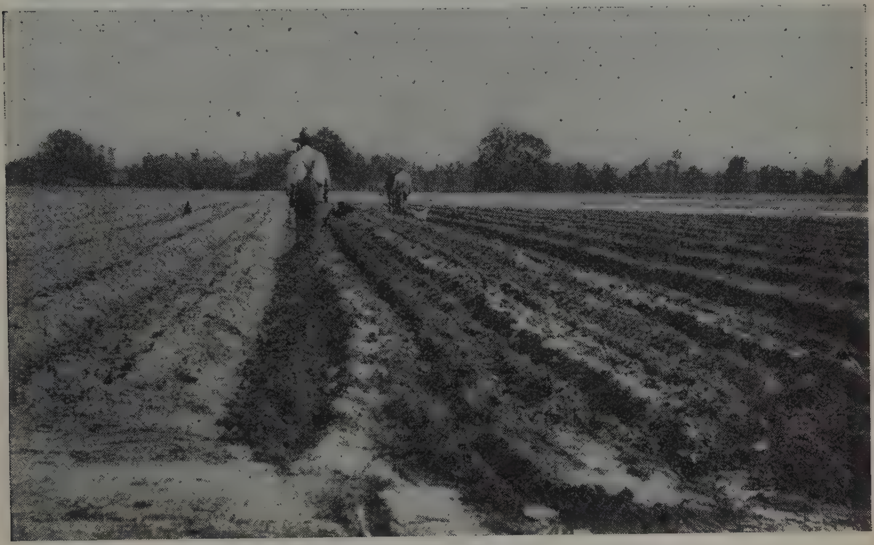

PLATE 224.

THE FIRST STAGE OF PLOUGH CULTIVATION.—Two deep furrows being made with a "bull-tongue" on either side of the rows of young tobacco. On the right may be seen a second plough following up with the next operation.

Plough Cultivation.

The object of this method is to deeply aerate the soil and build up a high bed about the plants. In this way, root development is encouraged, moisture is retained in the bed, surface water is drained to the middle of the rows, and leaching of fertilizer is minimised. Such a method should, therefore, tend to lessen the extreme effects of adverse seasons, whether they be excessively wet or dry for prolonged periods. Plough cultivation differs from the more general methods in that two or three good, deep cultivations are given instead of a continual shallow scratching of the soil, and that a broader and deeper bed is built up.

Details of the procedure are as follows:—The first cultivation is given as soon as the plants are established and have commenced to make growth (Plate 223). The first operation consists of making two deep, narrow furrows on either side of the row, and as close as possible to the plants without disturbing them (Plate 224). For this purpose a "bull-tongue" (Plate 221), which is a metal blade about eight to ten inches long by about two inches broad, is generally used attached to a "sweep" stock. It is inadvisable to leave the soil exposed in this state

PLATE 225.

THE SECOND STAGE OF PLOUGH CULTIVATION.—Two furrows being made with a turning plough, fitted with a small wing or mouldboard, on either side of the row of tobacco.

PLATE 226.

THE THIRD STAGE OF PLOUGH CULTIVATION.—Two more furrows being made with a turning plough fitted with a larger wing. At the right may be seen a group observing a hoeing demonstration.

PLATE 227.

THE FOURTH STAGE OF PLOUGH CULTIVATION.—The crust around the young plants being broken with a hoe.

PLATE 228.

FINAL STAGES OF PLOUGH CULTIVATION.—Making a single furrow with a "sweep" to widen the bed and clean out the middle of the furrow.

for more than an hour before proceeding with the next operation, as there is a danger of unduly drying out the soil. After a few rows have been thus treated, two more furrows are made with a small-winged turning plough (Plate 225). Thirdly, the bed is further built up with two or more furrows, made with a turning plough fitted with a larger wing or mouldboard (Plate 226). At this stage the soil crust immediately around the plants is broken with a hoe (Plate 227). Finally the bed is still further widened, and the middles are cleaned out by making a single furrow down the centre of the row with a "sweep" (Plate 228). At this stage, the more careful farmers make furrows across the ends of the rows to protect the crop from washing during periods of heavy rainfall.

PLATE 229.

"LAYING-BY" A TOBACCO CROP WITH A PLOUGH.—Making the second series of furrows with a turn plough. The "middles" are finally cleaned out with a "sweep." Note the size of the plants at this stage.

A second cultivation is made when the plants are about six or eight inches high. The "bull-tongue" is not used in these subsequent cultivations, but as before, furrows are made on either side of the row with turning ploughs with short wings and large wings; the soil is hoed about the plants, and the middles are cleaned out with a sweep.

In some cases, two thorough cultivations may be quite sufficient for the season, but more usually three cultivations are made before the crop is "laid by." Some judgment is required in deciding the best time to discontinue cultivation. It is not advisable to cease cultivation too soon, but damage is more frequently caused by carrying on too long and so injuring roots which have grown out into the space between the rows. The tendency with the more progressive farmers is to "lay by" after the crop has been growing for four to six weeks, and is a little less than knee-high. It is always advisable to carefully examine the soil in the furrows for roots before making the final deep cultivation.

The procedure advocated for the final cultivation or "laying by" a crop is as follows:—The soil around the plants is first hand-hoed, the earth being pulled up well around the stalks, and even covering the lower leaves. The first furrows are made on either side of the plants with a turning plough, to which a large wing or mouldboard is attached. These furrows are made far enough away so as not to damage roots, and yet as close as possible in order to throw the soil high up to the plants. After four or five rows have been so ploughed, another ploughing is made alongside each of these furrows (Plate 229). As in previous cultivations, the middles are finally cleaned out with a "sweep."

PLATE 230.

"LAYING-BY" WITH A "MIDDLE-BURSTER."—Running a "middle-burster" between the rows to "lay by" a crop which is too big to be worked with a plough.

If it has been found that roots have grown too far into the space between the rows to safely permit the use of the above method, it is then preferable to merely run a suitable implement down the centre of the furrow. For this purpose, a "middle-burster," which is a large type of shovel plough, is generally employed (Plates 221 and 230).

It is inadvisable to continually cultivate tobacco when it is suffering from dry conditions, as the condition is accentuated by roots being damaged in the process. Consequently, "laying by" the crop at the correct stage is particularly desirable when the latter end of the season is dry.

Topping and Suckering.

There is probably no operation in tobacco production which requires so much judgment and care, or which may have such disastrous results through lack of judgment, as that of "topping." The object of "topping" or removing the flower head and upper portion of the plant is to divert its growth to the production of marketable leaf rather than seed. If weather conditions were entirely dependable, this operation could be standardised, and would be consequently simple. However,

PLATE 231.
SUCKERING TOBACCO.—Suckering a field of tobacco in South Carolina.

since the weather is usually the opposite, and growers frequently "top" according to the weather being experienced at that time, or according to their anticipation of future weather conditions, the leaf produced may consequently be too coarse or too thin. The former occurs when plants are "topped" too low and a dry period is followed by rain

PLATE 232.
HARVESTING TRUCKS.—A load of trucks or sledges being hauled on to a field prior to harvesting.

PLATE 233.

HARVESTING TOBACCO.—A hessian-covered truck and team of labourers harvesting a field of tobacco in South Carolina.

which results in excessive new growth. The latter may occur when plants are "topped" high and with insufficient rain the anticipated growth is not realised.

One of the best growers interviewed indicated that he "topped" according to the known productivity of individual fields irrespective of the weather conditions of the current season. His procedure was to

PLATE 234.

ARRIVAL OF LEAF AT CURING BARN.—A truck of tobacco arriving at the curing barn. Note women stringing tobacco nearby.

allow plants to develop as many leaves to maturity as past experience had shown would be the case under average weather conditions. Over a period of years this method had been found very satisfactory.

A very sound and simple practice of "topping" is being advocated in South Carolina. It consists of pinching out the flower head only, during a normal season, as soon as a few flowers are in bloom. Later in the season, while suckering, those leaves which apparently will not develop to a marketable size are eliminated. Should the season be abnormally dry, it is advisable not to interfere with the plants at all, but to wait until rain falls and the plants respond to the plant food then available, prior to "topping."

"Suckering," which is the next operation, consists of removing secondary branches, which tend to develop after plants have been "topped." The usual practice is to remove suckers once a week after "topping" (Plate 231). They should be broken off as soon as they are large enough to handle, and should not be allowed to grow too large.

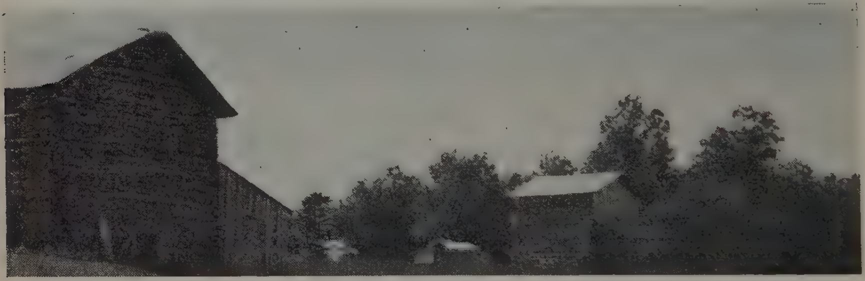

PLATE 235.

CURING BARNS.—Flue-curing barns in the Old Belt of North Carolina. Note tin roofs and log walls.

Harvesting.

Practically all flue-cured tobacco is harvested by "priming" or removing leaves separately from the plant as they reach maturity. Until recently, most of the leaf in Virginia was harvested by cutting the entire plant near ground level, and curing the leaf on the stalk. However, with the advent of a crop restriction policy, the priming method was rapidly adopted, since it is more efficient and more profitable.

The most important aspect of harvesting is to allow the leaf to thoroughly mature in the field before it is removed. With certain varieties, such as "Gold Dollar," and during dry weather, some judgment is necessary to distinguish between true maturity, and a yellowing, which may be a varietal characteristic or a physiological manifestation of insufficient moisture in the soil. Quality is very adversely affected if leaf is not properly ripe when harvested.

A wooden sledge or "truck" with walls lined with hessian (Plate 232) is employed usually to collect the leaf and carry it to the barn. It is drawn by a mule between the rows of tobacco (Plate 233), and some half-dozen men working on either side of it very rapidly fill the truck with leaf. Considerable care is necessary to avoid bruising the leaf during handling, and it should not be exposed to direct sunlight for any length of time. The trucks are usually covered with hessian when full.

On arrival at the barn (Plate 234), the leaf is strung on sticks in a similar manner to that practised in Australia. This operation is carried out in the shade of a shelter adjoining the barn.

Flue-curing.

The construction of flue-curing barns and the methods adopted for curing tobacco in the United States are relatively primitive and simple, in comparison with Australian practice. The use of the wet-bulb thermometer is not known, and facilities for the accurate control of the relative humidity of the air within the barns are in most cases lacking. Consequently, it would seem that the quality and condition of the leaf when harvested is such that it is relatively easily cured with success. Hence soil and weather conditions under which tobacco is grown, and cultural methods employed in its cultivation are apparently of far greater importance in the successful production of tobacco than the actual process of flue-curing.

PLATE 236.

CURING BARNS.—Flue-curing barns in Georgia. Note the small window at the gable end. The roof is made of shingles.

Flue-curing Barns.

Curing barns vary somewhat in detail throughout the flue-cured belt. They are usually wooden structures about 16 feet by 16 feet, and are frequently on a brick foundation. The walls may be of weather board on the outside, with a board lining and a coase builders' paper insulation between them, or may be of logs chinked with mud (Plate 235), or occasionally of brick tiles, tin, or rubberoid. In the more southern states, the roof is almost invariably constructed of shingles, which, incidentally, provide constant top ventilation. In North Carolina, owing to the relative shortage of timber, roofs are frequently made of tin (Plate 235). There are usually two doors (Plate 236), one on each side of the barn, and a small window at the gable ends of the roof,

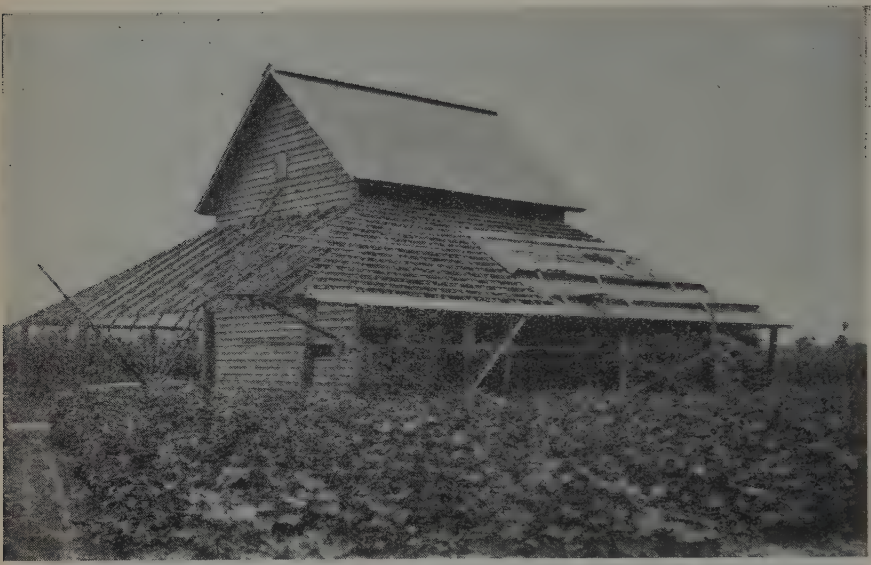

PLATE 237.

CURING BARN UNDER CONSTRUCTION.—A well-built curing barn in South Carolina. Note the large lean-to shelter roofs, the gable end window, and the fixed ventilator along the roof ridge.

which are useful for examining the leaf during curing (Plate 237). In South Carolina, the roof is frequently extended on two or three sides to provide shade for stringing the tobacco (Plates 237 and 238), and is often a storage place for tobacco sticks and implements. These overhanging roofs also protect the walls of the barn from the weather to

PLATE 238.

CURING BARN.—A typical curing barn on a farm in South Carolina.

PLATE 239.

DOUBLE FURNACE CURING BARN.—A crude flue-curing barn in Northern Florida. Note the height of the smoke stack.

some extent. In North Carolina, this aspect of barn construction is generally not so elaborate, and consists of a shelter on one side of the barn only (Plate 235).

The heating system is built of a series of sheet iron flues about 12 inches in diameter, leading out of one or more, frequently two furnaces. The furnaces are made of stone or brick, are five to ten feet in length,

PLATE 240.

SINGLE FURNACE CURING BARN.—Note the shingle roof, board walls, and short smoke stack.

and project well into the barn. The most general plan is to have the furnaces near two corners of the barn, and each system of flues in the form of a U. The flues either terminate separately in individual smoke stacks (Plate 239), or are united into one (Plate 240). The smoke stacks are rarely as high as the walls of the barn. Where there is only one furnace, the flue crosses the barn, branches at right angles, each arm follows the side walls, and eventually leads to a single smoke stack.

PLATE 241.

CURING BARNS IN AN IDEAL SITE.—Flue-curing barns in a well sheltered situation in South Carolina.

The ventilation system is often very crude. In many cases, top ventilation depends on the air spaces in the shingle roof, and spaces in the log walls entirely (Plate 239). At times an adjustable top ventilator is built along the ridge of the roof, but more frequently this ridge ventilator is a fixture (Plate 237) which allows a space of about two inches on each side of the roof. At times it does not extend completely along the length of the ridge, and not infrequently it is lacking entirely. In the better types of barnes, there are usually two loose bricks in the foundation of each of the four walls which may be removed to permit bottom ventilation. In many cases, however, there are no special bottom ventilators at all, and holes are dug under the walls to allow for ventilation should such be found necessary. Doors and windows may also be used for additional ventilation.

The more careful growers use discretion in building their barns in a suitable location. Sites are selected where the configuration of the country or belts of trees will tend to protect the barns during adverse weather (Plate 241).

Flue-curing Methods.

There is no fixed rule for flue-curing. Different types of leaf and leaves from different positions on the stalk require slightly different treatment. Furthermore, the methods adopted by individual growers differ somewhat in detail, and this, incidentally, tends to strengthen the suggestion that well grown, good quality leaf is relatively easy to cure successfully.

The general plan adopted is somewhat as follows:—The leaf is yellowed slowly at moderate temperatures, so that the process is completed at about 120°F., after 24 to 36 hours of curing. Ventilation is usually increased gradually during this stage. The colour is fixed, and the web of the leaf dried out by increasing the temperature and maintaining it at from 130°F. to 140°F., for a period of ten to eighteen hours. It is desirable to allow ample ventilation during this phase of the curing process, to obviate "sponging," and to avoid too rapid an increase in temperature, which might result in "scalding." The stems are dried out by reducing the ventilation and increasing the temperature to about 170°F., at the rate of five degrees an hour. This temperature is maintained until the stems are thoroughly dry and brittle. Too high a temperature results in a reddish discoloration or "scorch."

PLATE 242.

TOBACCO PACK HOUSE.—An elaborate pack house on a large plantation in South Carolina where the tobacco is bulked and graded.

Bulking and Grading.

After curing is completed and the leaf is sufficiently flexible, or in "order or case," so that it can be handled without breaking, it is removed to a pack house (Plate 242). It is there placed in long piles or "bulks," as in Australia, until it is graded. It is important that it should be kept in satisfactory condition after it is bulked, by shutting the pack house closely in damp weather and opening in dry weather, and by covering the tobacco with hessian, bags, or cloth.

In some cases the tobacco is transferred after a few days from the "bulk" to a "square coop." The latter is constructed by making a square pile of the leaf while still attached to the sticks. It is considered that tobacco retains its colour and keeps better for protracted periods by this method.

After at least ten days, but generally longer after bulking the tobacco is graded. There are apparently no set grades from the farmer's viewpoint, and the process is practically one of sorting the leaf into similar classes. As the curings are kept separate, and the leaf sold in small lots, it is automatically graded as to position on the stalk, i.e., into lugs, leaf, and tips. The grading consists of sorting these lots on a basis of colour, size, amount of damage, and possibly texture and body. Individual growers divide their crops into various numbers of grades.

CHAMBERS-REEVES
TARBORO

PLATE 243.

A TOBACCO MARKET STREET.—A truck load of leaf, carefully covered with hessian arriving at a tobacco market town in North Carolina. In front of it is a mule drawn wagon similarly laden.

Prior to grading, the leaf is brought into order, if necessary, in either specially constructed ordering rooms, or by using the curing barn.

In grading tobacco, the quality of light used is most important. Hence, in the Northern Hemisphere it is preferable to have the windows of the grading room facing the north, so that the light is indirect and uniform, in Australia, being in the Southern Hemisphere, they would face the south. The grader should sit with his back to the light.

After grading, the leaf is tied in hands in all flue-cured tobacco producing areas, with the exception of Georgia. There the tobacco is handled loosely as separate leaves, and is marketed in "sheets" or squares of hessian.

The United States Department of Agriculture has evolved a very comprehensive grading system for defining the grades of various types of tobacco, with the object of facilitating sales and obtaining the most satisfactory prices for growers. With flue-cured tobacco alone, six groups, six qualities, and five colours are recognised. The growers grade their own leaf, and, if they wish, they may have it inspected for a nominal charge by a government grader who issues a certificate as to grade according to the United States standards. The Tobacco Section of the Bureau of Agricultural Economics, during the selling season, also issues daily and weekly lists of average tobacco prices obtained at the various markets, for the guidance and protection of growers. Farmers who definitely know the actual grades of the tobacco they are offering for sale and the current prices for similar leaf, can consequently ascertain the true value of their product.

PLATE 244.

NATURAL LIGHTING OF TOBACCO WAREHOUSES.—Warehouse roofs in a Virginian tobacco market town. Note the numerous skylights to facilitate the examination of leaf at tobacco auction sales.

Marketing Flue-cured Tobacco.

Prior to taking tobacco to market the hands are straddled on thin smooth sticks. The sticks of tobacco are packed into a conveyance, well covered with hessian (Plate 243), and drawn to market. Good roads and modern motor transport enables the farmer to quickly travel considerable distances, and hence he usually has the choice of several market towns. Tobacco warehouses, where the leaf is auctioned, are usually constructed with ample natural light (Plate 244). On arrival, employees slide the hands of tobacco off the sticks and neatly pack them in shallow baskets. The contents of each basket is weighed. The weight of leaf, the grower's name, and the lot number is written in triplicate on a ticket and placed in each basket. A "floor sheet" is also made out for each vendor, giving details of the various lots to be sold on that day.

The baskets of tobacco are arranged in long lines on the warehouse floor. Several warehousemen, an auctioneer, and possibly a dozen buyers walk slowly down the aisles, disposing of the tobacco as they go. The bidding is started by a warehouseman who makes a rough estimate of each pile. On the completion of the sale, the price and the buying company's grade are marked on the card. Two clerks follow the auction and record details of the sales on each vendor's "floor sheet."

The rapidity of the procedure is remarkable. It is understood that the law prohibits sales progressing at a greater rate than 360 each hour (i.e., one sale each ten seconds), and the actual rate is not much less. At this speed, the recording clerks must find the correct sheet, record the weight and price obtained, and mentally calculate and enter the value of each pile. Immediately after the sale is recorded, unless the vendor is dissatisfied, the baskets are removed from the auction floor and are dispatched to a redrying plant. One sales ticket is retained by the warehouse, one is sent to the buying company, and the third goes with the tobacco.

BRICK WAREHOUSE

PLATE 245.
A TOBACCO WAREHOUSE.—One of several tobacco warehouses in a town in South Carolina where flue-cured tobacco is sold by auction.

The farmer may collect the proceeds of the sale, less certain selling charges, almost immediately from the warehouse, which pays on behalf of the buying company. During 1935, if the grower was not a contracting producer under the Agricultural Adjustment Administration, a fine was also deducted, and a further deduction was made by the government if it had loaned money to the grower. The multiplicity of bookkeeping thus involved in these various transactions proceeds almost as rapidly as the sales, and hence a farmer may have the net proceeds of his sale within a few hours of bringing his leaf to town.

Individual warehouses (Plate 245) may dispose of 200,000 to 300,000lb. of leaf daily in piles of an average weight of about 100 lb., and large marketing towns may have a daily turnover of several million pounds. Hence it will be noted that this selling system involves the disposal of huge quantities of leaf in small parcels with great rapidity. A tremendous amount of handling and bookkeeping results, and it is surprising that it works with such smoothness and satisfaction.

Redrying.

All individual purchases of flue-cured tobacco are dehydrated and brought to a uniform moisture content prior to packing and storing. As soon as the leaf is purchased (Plate 246), it is conveyed to a redrying house, which is usually situated close to the market warehouse (Plate 247) for this purpose. There the various lots of any one grade are blended by piling on to a conveyor belt, and during the process, damaged leaf is discarded and dust is removed. The hands of tobacco are then straddled on sticks which take it through the redrying machine. Should the tobacco be in a loose state, it is distributed evenly on a revolving belt and taken through the machine in that fashion. The time taken to pass through the machine, which is about 130 feet long, varies from 30 to 70 minutes. By means of heat, up to 200 deg. F., and air currents, all moisture is first removed from the leaf. At the far end of the machine, the tobacco is cooled to about 100 deg. F. and reconditioned or allowed to re-absorb moisture to any desired moisture content. Usually different grades of leaf are packed at specific moisture contents, which vary from about 10 to 14 per cent. For instance, wrappers are given a moisture content of about 13 per cent., fillers from 12 to 12½ per cent., and cutters from 10 to 11 per cent. Tobacco for export to England is packed at 10 to 10½ per cent. moisture content. On leaving the redrying machine, samples of leaf are continuously being taken and tested for degree of dryness. It is finally packed into hogsheads, each with a net capacity of 1,000 lb. or more, and firmly pressed or "prized" under hydraulic pressure, and nailed down ready for storage. It may reach this stage in a few hours after being purchased in the market.

PLATE 246.

AFTER A TOBACCO SALE.—Leaf being removed from a warehouse selling floor immediately after it has been auctioned. Note the wickerwork baskets in which the tobacco is sold.

Storage and Manufacture.

Owing to the tremendous size of the tobacco manufacturing industry, huge building space is required for the storage of tobacco, when it is being aged or mellowed, prior to manufacture. One large company advertises that it has 4½ miles of storage houses for its purposes alone. Tobacco is usually stored in sheds with open sides and overhanging roofs, but closed buildings which may have several floors are also used. Tobacco ages more rapidly in the former, but the latter have the advantage of being able to be effectively fumigated for the control of insects when necessary. Flue-cured tobacco is stored for eighteen months to two years or more before it is manufactured.

PLATE 247.

A REDRYING HOUSE.—A busy scene in the street of a North Carolina market town. Tobacco warehouses are situated on each side of the street. On the left, hogsheads of leaf which has been redried are being loaded on to a truck. The truck in foreground is conveying leaf from a warehouse to a redrying house.

In due course the leaf is stemmed, which is the process of removing the midrib. Prior to stemming, the tobacco is first conditioned for ten minutes or so, in order to put it into a fit state for handling, and is then conveyed to the stemmery. Stemming is usually a manual process, and great numbers of negro women are employed in this work. Machines, however, have been perfected for this purpose, and one type seen had a capacity of 14,300 leaves an hour. During this handling process, the tobacco is further cleaned of adhering sand and rubbish. The stemmed leaf may now be redried and again packed in hogsheads until required for manufacture, or go straight to the factory.

For the manufacture of cigarettes in the United States, tobacco is blended with regard to class, grade, and type. Several distinct classes, such as bright flue-cured, Burley, Maryland, and Turkish are used. In the factory, the leaf is conditioned, blended, and finely cut. Remarkably efficient machinery is employed for cigarette making, packing, and testing for defects. The daily output from individual factories and from cigarette manufacturing towns is tremendous.

[TO BE CONTINUED.]

Groundsel Bush or Tree Groundsel.

(Baccharis halimifolia.)

By C. T. WHITE, Government Botanist.

As the Groundsel bush is becoming a serious menace in parts of Queensland, and numerous requests have been received for a description and illustration of the plant, Mr. White's notes on the pest will be welcomed by all concerned.—ED.

DESCRIPTION.—A tall shrub, diœcious (i.e., the sexes on different plants), smooth or the young shoots somewhat scurfy. Leaves 1-2 inches long, obovate, prominently-toothed with a few large teeth in the upper portion, the lower portion gradually narrowing into a petiole or leaf stalk. Flower heads on the male plant, inconspicuous subglobose, small solitary, or a few clustered together. Flower heads on the female plant solitary in the axils of the upper leaves and clustered at the ends of the branches, forming large terminal loosely-branched panicles. Achenes (seeds) ribbed, straw-coloured, scarcely one line long, capped with a white pappus about ½ inch long.

Distribution.—A native of Tropical America; a naturalised weed in Queensland. Has increased a good deal of late years, and capable of becoming a considerable pest if not checked.

Botanical Name.—*Baccharis,* a name given by the Greeks to some aromatic plant dedicated to Bacchus; *halimifolia,* Latin relating to the plant having leaves like a Halimus, plants now placed under the genus Atriplex, which contains some of the Australian salt bushes.

Supposed Poisonous Properties.—*Baccharis* is a large genus of plants principally South American, and one species there, *B. cordifolia,* the Romerillo or Mio Mio of the Argentine, is well known as a stock poison.

As *B. halimifolia* has quite commonly been suspected of poisoning stock in Southern Queensland, particularly about Caboolture, Bald Hills, and other localities on the North Coast line, feeding experiments were made with the plant at the Stock Experiment Station, Yeerongpilly, and a report published in the Annual Report of the Chief Inspector of Stock, 1919-1920 (Annual Report Department of Agriculture and Stock, Brisbane, p. 677). Two heifers were fed continuously for a period of a fortnight on a ration of mixed leaves and chaff in almost equal proportions. Three guinea-pigs were fed for almost twelve days on the leaves, and ate them with avidity. One died and post mortem examination proved that the internal viscera were normal and full of partially-digested food. This animal was greatly emaciated, and although apparently the food was bulky, it lacked the necessary nutrient material to support life, and death had resulted from malnutrition. The two remaining animals looked healthy, but greatly emaciated and anaemic. These were started again on the normal ration and did well. Constipation was a marked feature in the stock fed on groundsel. From this, it would appear that the plant is not definitely poisonous to stock, but is quite valueless as a fodder.

Eradication.—It is possible that some mechanical means such as a roller of the kind used for breaking down Mallee might be employed, and the ground sown with a robust-growing grass such as *Panicum muticum* (Giant Couch), Guinea grass, &c. But experiments would have to be carried out before trying this system on an extensive scale, particularly as Groundsel Bush is rather a pest of second-class country. Where it invades the better and more fertile areas such as the Blackall Range and similar country, it seems to be confined to damp spots such as along creek banks.

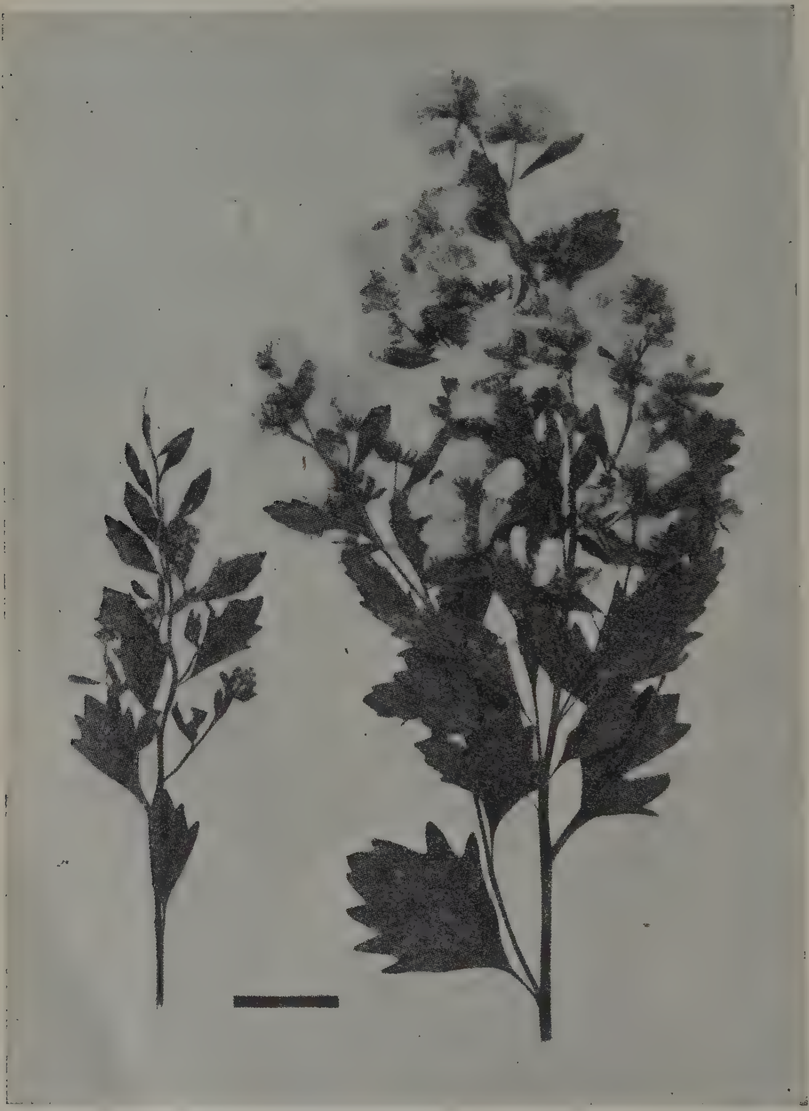

PLATE 248.
Tree Groundsel (*Baccharis halimifolia*).

A Programme of Pasture Improvement.

By C. W. WINDERS, B.Sc.Agr., Assistant (Agronomy), Agricultural Branch.

IN view of the interest which is now being taken in pasture improvement throughout the closer settled areas of Queensland, it is thought that a few short notes on various lines along which the farmer and grazier in the agricultural and adjacent districts may proceed towards better pastures would be of use to those contemplating planned pasture improvement.

There are three distinct angles from which the problem may be approached, namely:—

(1) Better utilisation of existing pastures;
(2) Improvement of existing pastures by renovation and topdressing;
(3) Laying down of superior pasture mixtures.

1. Utilisation of Existing Pastures.

Most improved grazing properties in the areas of medium to good rainfall carry a certain acreage of grasses which have up to date shown themselves superior for general grazing purposes in each particular district to other grasses. Thus in Southern Queensland on good class coastal lands *Paspalum dilatatum* is the chief dairying grass, while in the sub-coastal valleys Rhodes grass is pre-eminent. On all such properties one of the first steps which should be undertaken is the subdivision of large paddocks of the more useful pastures, with the object of putting into operation a system of management which will permit of the maximum grazing value being obtained from the areas.

The greatest advantage resulting from subdivision is the opportunity afforded of always during the grazing season having short young grass available to the animals. Under existing conditions on many properties the control of the grazing areas is so lax that much of the pasture runs to maturity early in the season and is useless for further grazing during that season. This waste can be prevented only by efficient subdivision and subsequent proper management. Correct management, when weather conditions permit, consists in grazing small paddocks in rotation, the pasture on each paddock being grazed when short and of highest feeding value and allowed to recover by spelling for a few weeks. Towards the end of the season the stock may not be able to cope with the growth on all paddocks and the mower will then have to be used to keep the grass down.

A practice which might with advantage be adopted on all dairy farms is the scattering of animal manure by means of harrows. Grass growing through animal droppings is generally avoided by stock, resulting in the growth of worthless clumps of grass. If the droppings are evenly distributed over the pasture by harrowing at intervals, much benefit to the pasture results and a good deal of waste is avoided.

2. Improvement of Existing Pastures by Renovation and Topdressing.

Many areas of sown pasture which have been laid down for some considerable time are producing much below their capacity. A considerable improvement in these pastures may be effected by breaking up the matted grass, either by ploughing or by drastic harrowing with special implements. The action of renovating implements is to correct the sod-bound condition of the grasses and to improve the soil conditions. The net result is a fresh lease of life for the pasture, and pastures which show a marked decline in productivity may to some extent be restored to their original condition by renovation treatment. In those situations where crops can be grown, a more effective means than periodical renovation of maintaining high-producing pastures is to treat pasture as a unit in a crop rotation, allowing one or two seasons' cropping between 3-5-year stands of pasture.

Though very often adverse weather conditions prevent the full benefit of fertilizer application from being realised, many dairy farmers and graziers have used pasture fertilizers with encouraging results. Much of our coastal grazing country is deficient in lime, and applications of 1 ton of agricultural lime per acre have produced a marked improvement in the pasture. Superphosphate in most instances has a marked effect on pastures on all but the richest soils, and applications of nitrogenous fertilizers produce results which may be economically obtained. Usually it is necessary to renovate a pasture by mechanical treatment before efficient top-dressing can be carried out.

3. Laying down of Superior Pasture Mixtures.

On a great number of properties the best of the proven general purpose grasses are well-established, but each has its limitations and information is every day being sought by dairymen and graziers regarding pastures for special purposes. There is an increasing demand for advice concerning winter pastures, and information obtained from numerous trials is made available by the Department of Agriculture and Stock. Of the pasture plants which can be recommended for winter grazing, the following are of chief importance:—

Perennial species:—*Phalaris tuberosa* (Toowoomba Canary grass); Perennial Prairie grass; Perennial Rye grass; Cocksfoot; White Clover; Red Clover; Lucerne.

Annual Species:—Italian Rye Grass; Wimmera Rye grass; Prairie grass; Burr Trefoil.

The choice of a pasture mixture for winter grazing purposes must be based upon a number of factors, including the average winter rainfall, the chemical and physical characters of the soil, the cultivation treatment the land has received, the length of time the pasture is expected to remain, the aggressiveness of weeds, &c.

Farmers and graziers interested in sowing winter pastures are invited to avail themselves of the services of the Department of Agriculture and Stock. Pamphlets dealing with sown pastures and their management will be supplied free on request to the Department of Agriculture and Stock, William street, Brisbane.

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BROWN HAWKS AND CATERPILLARS.

For its services in exterminating caterpillars the brown hawk exacts a tribute of poultry, but apart from its random raids on the poultry yard it is a most valuable friend of the farmer. John Gould, "father" of Australian ornithology, found the brown hawk congregating in hundreds in a district where a caterpillar plague was raging. The birds battened on the pest. In the centre of Australia, when some of Gould's party fired the spinifex grass and as small marsupials, lizards, and mice were disturbed by the flames, the brown hawks appeared in large numbers, and, dashing through the dense smoke, seized their prey as it dashed from tussock to tussock.—From "Bush Notes," by Norman McCance in "The Australasian."

Fat Lamb Raising

FARMERS' WOOL SCHEME.

THE object of this scheme is to make available to small growers a scheme by which to have their wool properly classed for market in the hope of selling it to best advantage. Where an owner is only running a few hundred sheep the quantity of wool is not sufficient to be skirted and classed into bulk lines on the property. There is no necessity for skirting the fleeces when preparing it for despatch to the scheme; merely to remove wet stains, roll the fleece and pack it for preference in a good pack. Keep the bellies, locks and sweepings separate, or if packed in the same bale, partitioned off with paper or other light material. Bags, butts, fadges and parcels of any size and shape are received, but no matter what wool comes to hand all the consignments are treated alike. Each individual package or bale is weighed on receival, numbered and entered up in the receival book, then partly opened and valued. The colour, condition and type of wool is noted and placed according to the above in their respective groups. These groups are added to as their respective types are received, which assists greatly in the classing, as it allows for even classes to be maintained until bulk lines are secured. The scheme is available to the following:—

(*a*) Holdings of less than 1,500 Merino sheep;

(*b*) Wool from crossbreds or British breeds from any holding;

(*c*) Bags and butts from any holding;

(*d*) Star lots from our present selling agents.

As shown in (*a*) it will be seen that an owner of less than 1,500 sheep has the privilege under the scheme to forward all or any portion of his clip.

Under the heading (*b*) the wool from crossbreds and British breeds will be received from any holding regardless of the number of Merinos they are running. This provision was inserted owing to the introduction of sheep of the British breeds for cross-breeding and fat lamb production under the Fat Lamb Scheme. Very few, if any, owners forward crossbred wools to the Brisbane market in classed bulk lines, therefore it must be placed on the market at a disadvantage unless advantage is taken of the scheme.

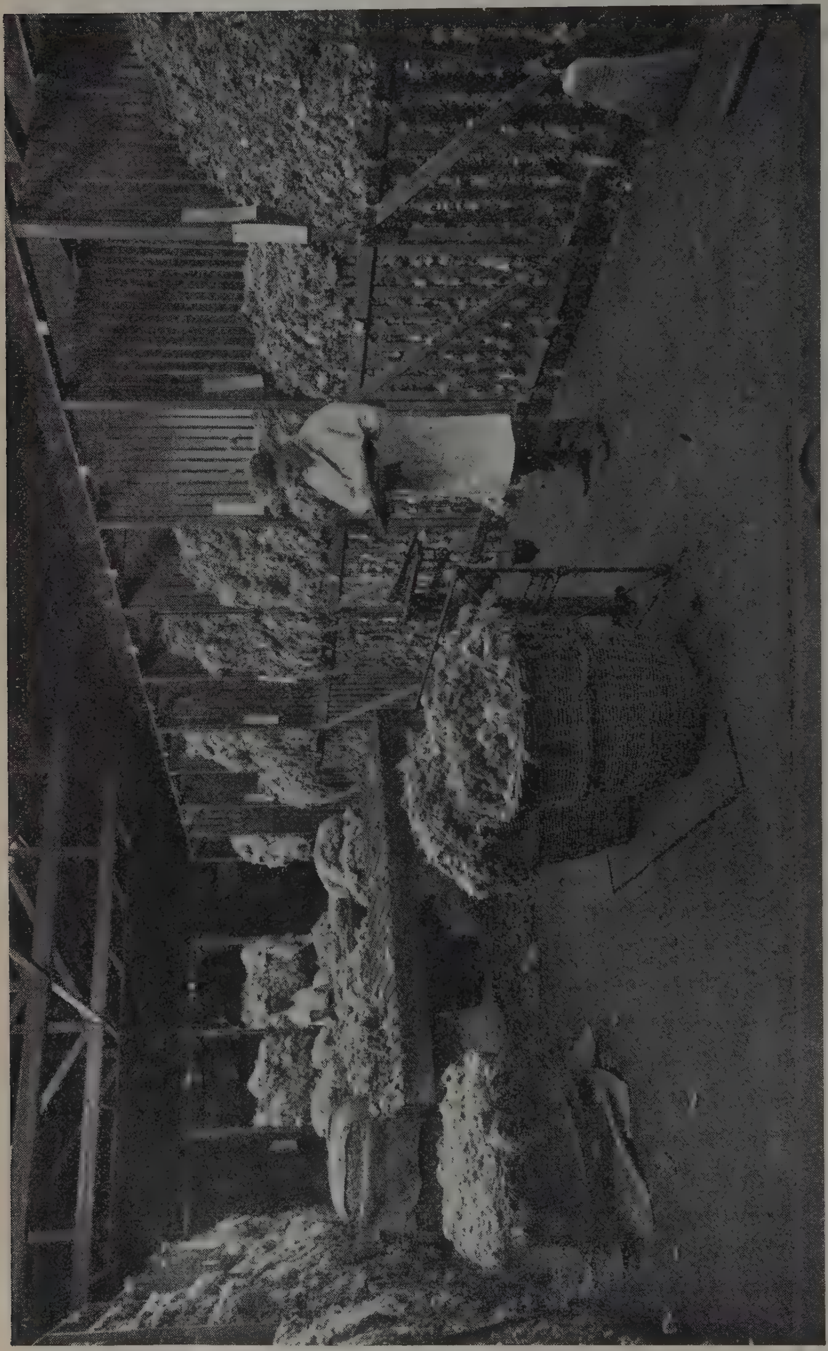


PLATE 249.

WOOL ROOM, DEPARTMENT OF AGRICULTURE AND STOCK—Weighing Classed Wool for Bulked Lines in the Bins.

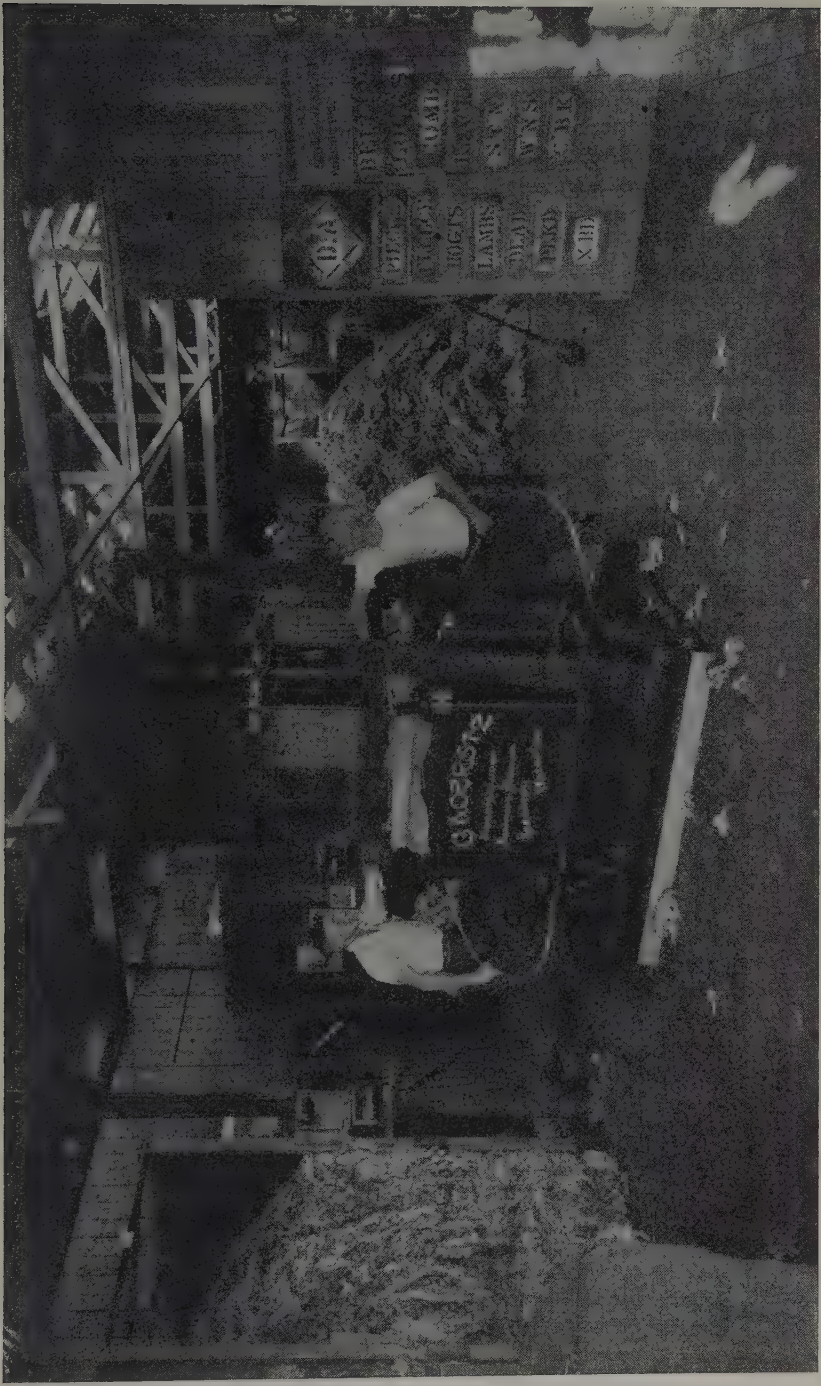


PLATE 250.
Pressing and Baling Classed Wool.

It is provided in (*c*) that bags and butts will be received from any holding. By this it is intended that instead of sending bags and butts to the market in that state, they may be forwarded for classification and thereby pooled into bulk lines. This was intended to be an important addition to the scheme and one deserving of the support of all wool growers. Its importance evidently has not been recognised as very few consignments have been received to date. Naturally, it loses its value unless the quantity received will give sufficient accumulation to form bulk lines of the different classes included in all consignments.

Too much importance cannot be placed on this phase of the scheme and the odd lots that big growers despise as not being worth while would so assist the small growers who would benefit that an advantage of value would result if all wool growers would support it.

(*d*) provides that star lots from our present selling agents be received. This provision was introduced to allow the agents, selling the wool for the season, to make full use of the scheme in order that their clients may secure the advantage likely to be gained without detriment to other brokers. Still it must be borne in mind that a large percentage of star lot wools are properly classed and command attention as such.

Sixty per cent. of the estimated value of the wool is advanced free of interest to those owners who are running less than 1,500 sheep. Cartage and railway freight is paid in addition to the 60 per cent., and if the owner advises that he is shearing a given number of sheep and consigning it to the Department, the wool is covered by insurance from the sheep back to shipping.

When the wool is brought forward for classing it is again weighed for checking up purposes, thus making sure that the correct weight goes to the tables for classing. As the wool is classed it is weighed and placed into its respective bins and each weighing entered in the classification book. When all one grower's wool is weighed into the respective bins and entered up in the day book his name together with the total weight of each class is entered on a bin card which is attached to each bin. The bins are classed into until the accumulation is sufficient to go into bulk lines or until all that particular type of wool is classed.

The wool is then pressed with an up-to-date power press, recently installed, the bale is numbered, weighed, entered up in the bale book and branded "DA" in diamond, class number, together with "Classed on owner's account by the Department of Agriculture and Stock" when it is ready for despatch. The number of each bale is recorded on the bin card, so that when the card is passed on to the Accounts Branch the name of each grower who has wool in a given class is shown, together with the amount of wool he has in it and the bale in which it is included,

When each consignment of wool is received it is entered up in quadruple form, three of which are kept by the Department and one is forwarded to the selling agent who has the arrivals recorded with the Wool Selling Brokers' Association for inclusion in the catalogue under the usual closing date regulations. When the wool is sold our agents make payment to the Department in keeping with their usual method.

When the statement and cheque is received by the Accounts Branch they in turn make out the sales account for payments to the various

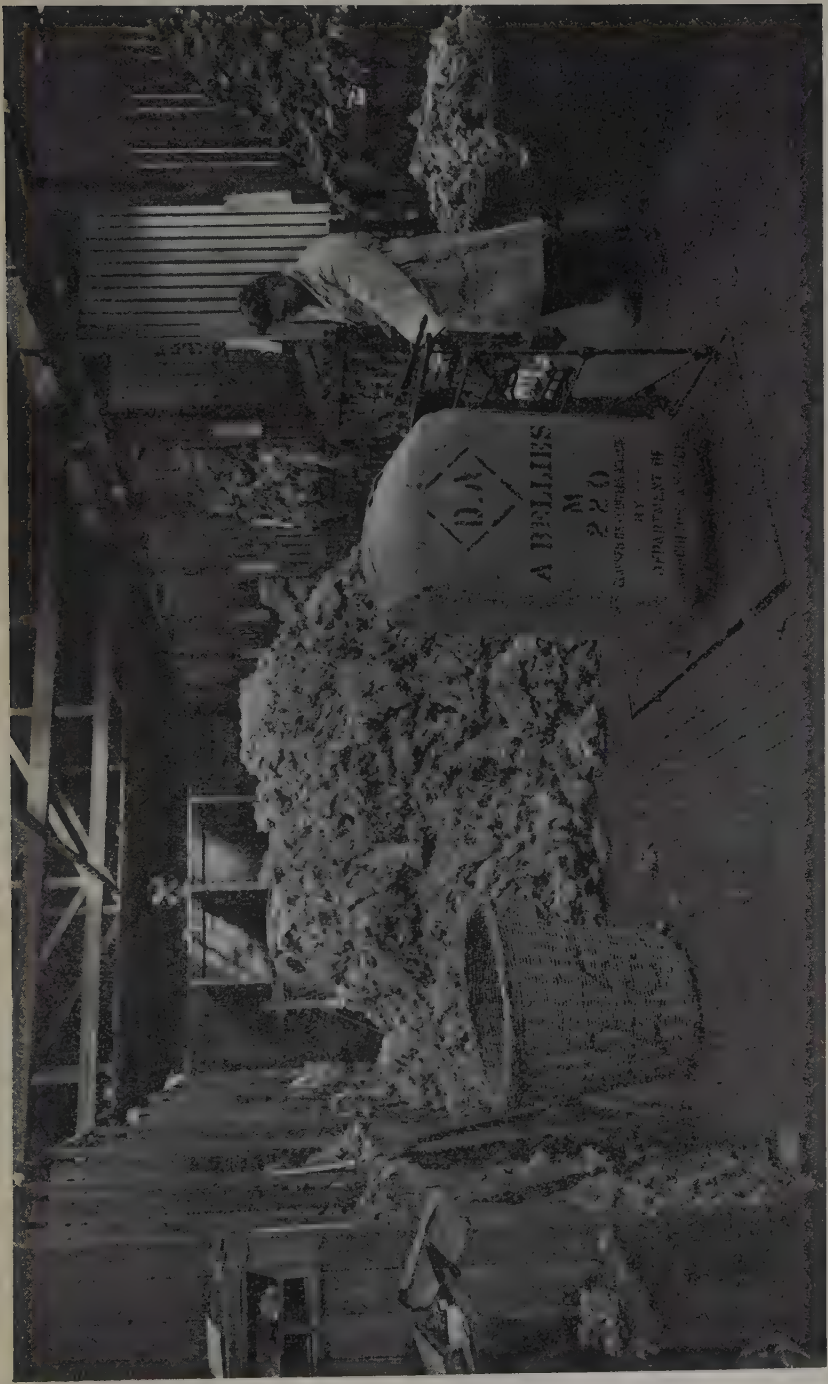


PLATE 251.

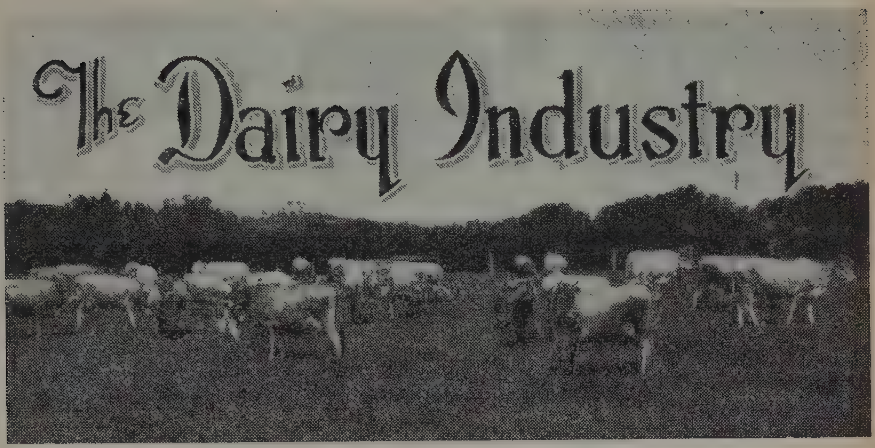
Weighing Bales for Despatch to Selling Agents.

farmers who are included in the sale. This is no easy task, as probably thirty farmers may have wool in ten or fifteen classes sold in one sale. All bales that can be used again in forwarding the wool to market are credited to the grower in keeping with the average bale weight of the sale, while those for whom bales are supplied are debited in keeping with the weight of their wool in the sale.

[TO BE CONTINUED.]

PLATE 252.

One of many unnamed waterfalls in the Lower Coomera, near Binnaburra, Lamington National Park, Macpherson Range, Queensland.



THE COMPOSITION OF MILK.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

MILK may be defined as the white fluid secreted by the mammary glands of female mammals for the nourishment of their young. The fluid which is most commonly called "milk" is that obtained from the cow. This animal, by a process of selection, has been developed to such an extent that certain types secrete much more milk than is required by its calf and this is utilised by man for his own nourishment. Milk obtained from the goat, camel, buffalo, ewe, mare, reindeer, and certain other animals is used in certain countries for the same purpose.

As a food, milk and its products are gaining favour. This is not surprising as each of the solid constituents has a definite food value.

The average composition of cow's milk is as follows:—

	Per cent.
Water	87.1
Fat	3.9
Proteins	3.2
Lactose	5.1
Mineral ash	0.7

It is shown in greater detail in Table I.

Other constituents which are present in smaller quantities, but which play an important physiological role include enzymes, vitamins, iodine, lecithin, and cholesterol. Dissolved gases such as oxygen, nitrogen, and carbon dioxide are also found in milk. Figure 1 shows the relative proportions of the main milk constituents and Plate 253 shows the constituents of one quart of milk.

Water.

The water of milk is the same colourless liquid which is known to everyone.

In milk it serves two important purposes. Firstly it holds the other constituents in suspension or in solution. The lactose and portions of the ash and proteins are dissolved, while the fat and the remainder of the proteins and ash are suspended in the form of very small particles. The food constituents are therefore in a condition capable of being immediately digested without the need of mastication.

Secondly it dilutes the solids to such a bulk that it forms the perfect food for the calf. With less water, the solids would form a too concentrated food for the delicate digestive organs of the young animal. These are some of the reasons why milk is such a valuable food for children and invalids.

As water comprises such a large proportion of milk, and the cow in addition requires water to sustain its own life, a liberal supply of good clean drinking water should always be available . An average of fifteen gallons of water per day is required by a cow in milk.

The constituents other than water are known as milk solids. These may be divided into "fat" and "solids not fat."

Milk Fat.

Milk fat is not the simple substance it appears. It is a mixture of at least nine fats, which are given in Table II.

Most of these are liquid at ordinary temperatures. Various factors influence the proportions of the constituent fats. Young succulent grass causes the proportion of the liquid fat olein to increase, and a softer fat is therefore obtained in spring and early summer following the response of the grass to rain and warm weather.

The flavour and aroma of butter is influenced by the proportion of the soluble and volatile fatty acids. When these form a greater proportion than usual, a butter with a stronger and more pleasant aroma and taste results. This is easily explained, as it is only volatile substances which can be smelled, and only soluble substances which can have any effect on the sense of taste.

The fat exists in milk in the form of very minute globules which are in a state of suspension throughout the milk serum; this being the name given to that portion of milk other than fat. These fat globules vary in size with the breed of the cow and a number of other factors, but the average diameter of a globule is one ten-thousandth part ($\frac{1}{10,000}$) of an inch. To give some idea of their very small size, one drop of milk may contain from 100,000,000 to 150,000,000 fat globules.

Solids not Fat.

The solids not fat consist of lactose, proteins and the mineral ash.

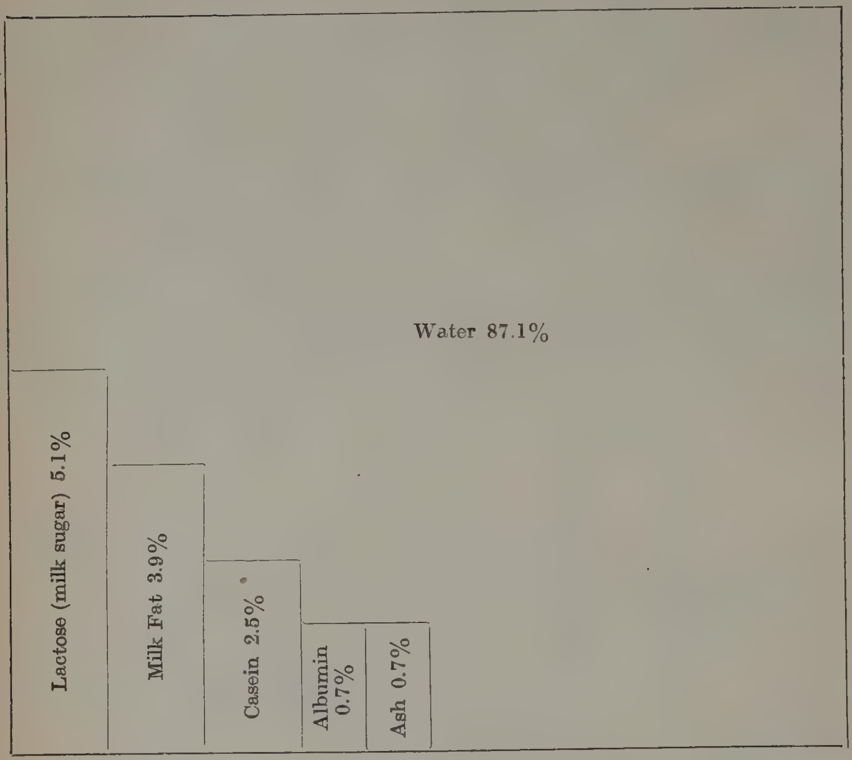
Lactose.

Lactose, or milk sugar, is only found in nature in mammalian milk. It contains the same elements, namely, carbon, hydrogen, and oxygen, and in the same proportion as in sucrose or cane sugar, but differs in certain of its physical and chemical properties. It is less sweet to the taste and is not so soluble in water as is cane sugar. It is one of the constituents which is entirely in solution. It is easily decomposed by

TABLE I.—COMPOSITION OF MILK.

	Per cent.		Per cent.		Per cent.		Per cent.		Per cent.		Per cent.
Milk	100	Fat	3·9	Olein		Glycerides of insoluble and non-volatile fatty acids	3·4	Fat	3·9	Total Solids	12·9
				Palmitin							
				Stearin							
				Myristin							
				Butyrin		Glycerides of soluble and volatile fatty acids	0·5				
				Caproin							
				Caprylin							
				Caprin							
				Laurin							
		Milk Serum	96·1	Casein	2·5	Total Proteins	3·2	S.N.F. (Solids not fat)	9·0		
				Albumin	0·5						
				Other Proteins	0·2						
				Lactose or		Milk Sugar	5·1				
				Potassium Oxide		Ash	0·7				
				Sodium Oxide							
				Calcium Oxide							
				Magnesium Oxide							
				Iron Oxide							
				Sulphur Trioxide							
				Phosphorus Pentoxide							
				Chlorine							
				Water							87·1
											100·0

FIGURE 1.—THE CONSTITUENTS OF MILK.



lactic acid bacteria when in solution, with the formation of lactic acid. This bacterial action is the cause of the souring of milk, and is one of many changes which occur during the manufacture of cheese.

The proteins of milk consist mainly of casein and albumin.

Casein.

Casein forms about 2.5 per cent. of milk. It exists in the form of an exceedingly fine colloidal suspension. There are reasons to believe that it is loosely combined with calcium or lime compounds.

The presence of casein makes the manufacture of cheese possible. As milk sours casein is coagulated, or precipitated, and this solidification

TABLE II.—COMPOSITION OF MILK FAT.

Fat.	Per cent.	Melting Point °F	Condition at Ordinary Temperature.	Properties of the Fatty Acid.
1. Butyrin ..	4	about—80	Liquid ..	Soluble and volatile
2. Caproin ..	3·5	..	ditto ..	ditto
3. Caprylin ..	0·5	16	ditto ..	Partly soluble and volatile
4. Caprin	2	31	ditto ..	ditto
5. Laurin	7	44	ditto ..	ditto
6. Stearin ..	2	123	Solid ..	Insoluble and non-volatile
7. Myristin ..	20	88	ditto ..	ditto
8. Palmitin ..	26	145	ditto ..	ditto
9. Olein	35	41	Liquid ..	ditto

of the casein traps much of the fat and lactose. Cheeses made from such sour milk curd include what is generally known as cottage cheese. When rennin, or rennet, is added to milk, the casein is again coagulated but, in this case, the curd traps more of the mineral constituents of milk notably calcium. This curd is the source of most varieties of cheese, the different varieties depending on the after treatment of the curd and the action of different types of bacteria.

In addition to its value as a foodstuff, casein has a considerable commercial value. It finds use in the manufacture of artificial jewellery, imitation bone and ivory, buttons, piano keys, imitation amber and ebony, cold water paints, leather dressings, waterproof glues, paper sizing, horticultural sprays, and a number of other ways.

Albumin.

Albumin the other main milk protein, is present to the extent of about 0·5 per cent. This protein differs from casein, being in solution in the water portion. It differs also in not being coagulated by souring or by the action of rennin. However, by heating milk above 158 degrees F., albumin is coagulated, while casein remains unchanged.

Ash.

The mineral portion of milk is generally known as ash. It is not known in what manner the mineral matter is arranged or combined in milk, but the following constituents are all present in the ash:—Sodium, potassium, calcium, magnesium, iron, phosphorus, chlorine, sulphates, carbonates, and smaller quantities of other substances.

Pigments.

Milk also contains two colouring substances. Carotin, a yellow substance dissolved in milk fat, causes the familiar yellow colour of butter. The second, known as lactochrome, is dissolved in the water of milk, and to this is due the greenish yellow colour of whey.

Vitamins.

A description of the constituents of milk would be incomplete without mentioning the vitamins known to be present in milk.

Vitamin A is present in the milk fat. This vitamin is essential for the maintenance of good health inasmuch as its absence from the diet results in a lowered power of resistance to disease, particularly diseases of the throat and lungs. Milk, cream, butter, cheese, and other milk products which contain milk fat are, therefore, of considerable value. Any excess of this vitamin which may be taken into the system is not wasted as it is stored in the liver until such times as it is required. Most vegetable oils are lacking in this particular vitamin.

Vitamin B is soluble in water and milk is one of the main sources. A lack of this vitamin results in nervous disorders such as beri-beri and pellagra.

Vitamin C is also soluble in water and is essential for the prevention of scurvy. Although citrus fruits are the chief sources of this vitamin, it is also present in milk in valuable amounts.

Vitamin D is a fat soluble vitamin known as the anti-rachitic vitamin. This vitamin prevents such complaints as rickets, provided sufficient lime and phosphoric acid are also available in the diet. Milk fat is a valuable source of this vitamin, while vegetable oils contain practically none.

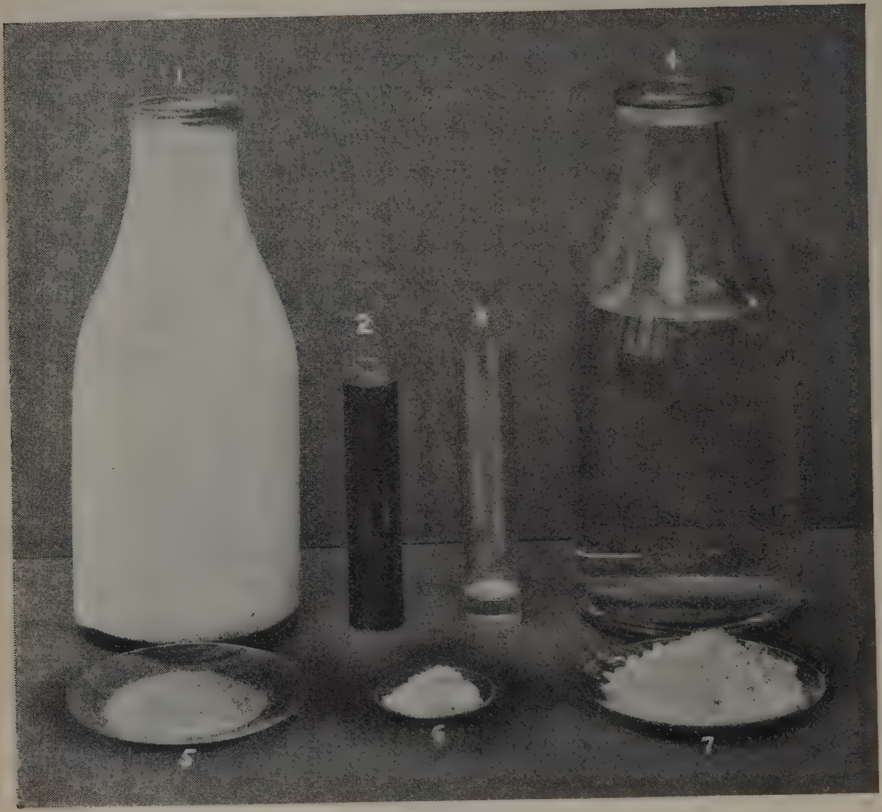


PLATE 253.

THE CONSTITUENTS OF ONE QUART OF MILK.—1. Milk. 2. Milk fat. 3. Albumin. 4. Water. 5. Casein. 6. Ash. 7. Lactose.

Vitamin E is also a fat soluble vitamin, and a lack of this vitamin results in the degeneration of the reproductive organs. This vitamin is considered to be more widely distributed among the foods than most of the other vitamins, and milk is said to be one of the secondary sources of supply.

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Progress of the Pig Industry

KEEPING PIGS HEALTHY.

*By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

NOW that pig-raising is taken more seriously by Queensland farmers, as is indicated by the vast increase in pig production during recent years, larger numbers of pigs are being kept on farms, and this more intensive pig population necessitates more care in the handling of the pigs to keep them healthy. Where five or six pigs are kept on a property the risk of disease is small, but if the stock are increased to fifty or sixty head, the provision of food and accommodation must increase in proportion if these pigs are to be kept healthy.

Health in the pig is a normal state of the body, and when the animal is normal it is able to grow and reproduce according to its inherited ability and the feeding and care which it receives, and as the farmer's primary object in keeping pigs is to have them growing and reproducing to the best of their ability on the available food supply which they are expected to profitably convert into pork, it is his duty to maintain his stock in a healthy condition.

Pigs may be unhealthy to a slight degree, insufficient for the average person to notice, but even in this condition, which may be caused through some deficiency in the diet or by a light infection, pigs are not able to convert their food to pork in the most efficient manner. Such minor troubles can best be detected by weighing the pigs regularly through their growing period and checking their food consumption and rate of gain. Losses caused by such slight troubles which are only apparent when carefully kept records of growth and food consumption are available probably cause greater waste in the pig industry than the very obvious cases of disease which cause death of pigs on the farms or condemnation of carcasses by meat inspectors.

The percentage of actual losses of pigs or carcasses in Australia is very small in comparison with that of other countries, this happy state of affairs being due to our sparsely distributed pig population, our congenial climate, and our quarantine system, which prevents the introduction of diseases from other countries and controls the spread of diseases within the Commonwealth.

The troubles which we have affecting the pigs of Australia are causing sufficient wastage to command the attention of every pig raiser

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* In a broadcast address from Radio Stations 4QG, Brisbane, and 4RK, Rockhampton. By courtesy of the Australian Broadcasting Commission.

in an endeavour to eliminate losses as far as is practicable. Australia is now established as a pork-exporting country, and to be able to sell on the world's markets it is necessary to produce at least as efficiently as other countries, and the elimination of waste will help towards that objective; it is therefore essential that every pig raiser study his business carefully, keep records of production which will aid in detecting the small losses, and then set about eliminating these losses. Also with the increasing pig population greater care must be taken in pig husbandry to avoid outbreaks of more serious diseases which are usually associated with dense pig population.

As in the case with all farm animals, when increased production is brought about by the work of stud breeders in selecting and breeding individuals which inherit high production, those highly bred stock must be given more than ordinary food and attention if they are to be kept at a high state of production, and if the food requirements are not kept up to such animals, they will probably go on producing in accordance with their inheritance but to the detriment of their constitution, which would eventually collapse. For example, consider the breeding sow that, through advanced animal husbandry, has been bred capable of producing a litter of ten pigs, which weigh 40 lb. each when eight weeks old; she is a very productive sow, and a vast improvement on the wild sow running under natural conditions. This very productive sow requires large amounts of food—in fact, she will eat up to 16 lb. of dry meal daily while she is rearing her litter—and her food must contain certain minimum amounts of particular nutrients; if she receives insufficient of any of these nutrients, she will most likely draw on supplies from her own body, but there is a limit to this source and eventually her health is injured and she is a fit subject for attack by disease-producing organisms. Some pig raisers maintain that high-producing stock are more susceptible to disease; they are not necessarily so, but they do require a better supply of food than low producers.

Practically all diseases and parasitic infestations in pigs in this country can be prevented or efficiently controlled, and the methods of doing so are fortunately identical with recommended practices of economic pig-raising, so that the maintenance of healthy pigs is a matter of sound pig-raising practice.

The necessary precautions for keeping pigs healthy may be dealt with under the headings of breeding, nutrition, and accommodation, although these three factors intermingle in piggery management.

When selecting prospective breeding stock, the pig raiser should either be satisfied that he is a capable judge or he should hand the job over to someone who is capable of determining as far as is possible whether the stock in question are desirable from the points of view of apparent constitution and productivity. There should be proper balance of constitution and trade requirements in the make-up of the pig. For example, the bacon and pork trades require that pigs should be light in the fore end which gives the cheaper cuts of meat, but from the breeder's point of view chest capacity is essential for a strong constitution, and therefore, while the shoulders and neck should not be too pronounced and covered with excessive deposits of fat, the chest should be reasonably deep and broad if the pig is to be vigorous, healthy, and fast-growing.

There should be more certainty of securing good sound stock from registered stud breeders than from unregistered breeders, and in most cases such men can be relied upon to select good stock for clients. The value of pedigreed pigs lies in the fact that they have been bred for many generations along particular blood lines with the object of maintaining or improving standards, and as no studmaster breeds from pigs which he considers are not going to improve his herd there is every probability of those pigs inheriting the most desirable characteristics. It must be remembered, however, that environment, including food, plays a big part in developing the pig and it is possible for even stud pig breeders to lose good qualities in their pigs if they neglect the feeding. Therefore, don't select pigs on pedigree alone; select on appearance, performance, and pedigree, the pedigree being a fairly good guarantee that the stock will reproduce their characteristics.

Whilst probably no stud pig-breeder can guarantee his pigs positively free of disease or parasites one can usually gain information regarding the possibility of infection by observation of the condition of sanitation in the piggery and by asking a few questions.

The mating of closely related pigs is a frequent cause of weak constitutions, and while line breeding does in some cases produce good results, the practice should be left to those breeders who are prepared to experiment and cull the weeds if the results are unsatisfactory.

Any tendency towards a constitutional weakness as indicated by faulty conformation of breeding sows may be remedied in their progeny by using a boar which has pronounced strength in the point where the sows are weak; such practice is known as corrective mating.

Pigs can only reproduce their inheritance of growth and production if they receive the necessary fuel. The feeding of pigs is dependent on the availability and cost of foods, but if too much notice is taken of these two points there is a big chance of dietetic deficiencies occuring. It is always practicable, however, for pig raisers to add to the readily available cheap foods such other foods as are necessary to prevent deficiencies. With some systems of feeding there is a probability of deficiencies of minerals which cause disturbances of health and lead to more serious disorders. In order to avoid such pitfalls, the pig raiser must have some knowledge of the principles of nutrition. The man who thinks that molasses and water will satisfactorily replace separated milk in a pig's ration is courting disaster.

Nutrition is a complex subject and too vast to be dealt with now, but for those who require more detailed information on the subject there is a free publication entitled "Pig Feeding," available from the Department of Agriculture and Stock, Brisbane.

Without knowledge of the principles of nutrition the pig raiser can avoid a lot of trouble by feeding his pigs plenty, variety, and food that is free of disease-producing organisms.

In accommodation, more than in any other aspect of pig raising, there is scope for improvement with the objective of maintaining healthy pigs. In planning pig accommodation, comfort and sanitation for the pigs must be the chief consideration.

Protection from the extremes of climate is necessary if pigs are to be absolutely healthy. Exposure to cold and dampness predisposes pigs to various ailments, whilst excessive heat from the sun may cause considerable distress or even death; hence the necessity for shelter from the extremes of weather.

As most infections are caused by microbes or worm parasites the infective stages of which lurk on the floor of pig pens and yards or in troughs, it is necessary to have control over the hygiene of the surface of these floors and troughs. Impervious material such as concrete is adaptable to thorough cleansing and is therefore very suitable for pig pen construction, provided there is ample water and labour to do the cleansing. Concrete is expensive and pens made of same must necessarily be small; so where such pens are used pigs are run intensively on small areas.

Another way of maintaining sanitation and health in the piggery is to have the pigs spread over a large area of land which is periodically rested and grassed or cultivated and planted with some grazing crop. This is the paddock system of pig raising which is becoming more popular with Queensland farmers and is giving excellent results.

In the paddock system the object is to keep the ground as fresh and free from infection as possible; the best means of doing this is to plough the paddocks at least twice yearly, working the implements close to fences. Sheds, troughs, and other equipment used in the pig paddocks should be movable so that in cultivation, the soil near the equipment, which is usually more fouled than the rest of the paddock, can be turned over. The paddocking of pigs is not only health-promoting but economical in every way.

Sunshine is the farmer's cheapest germicide and it also destroys embryo worms which affect pigs. Every use should be made of this powerful weapon by allowing the early morning sun's rays to penetrate into every part of sheds and troughs in the piggery; by facing open-fronted sheds to the north-east this can be accomplished and the pigs still have protection from inclement weather and sun's rays during the hotter part of the day. Pigs are very healthy animals if given a chance, and it is in the interests of every pig raiser to give his pigs that chance.

* * *

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Horticultural Notes

THE PERSIMMON.

By H. BARNES, Director of Fruit Culture.

THE Persimmon, or Japanese Date Plum as it sometimes called, is a hardy fruit tree which will grow almost anywhere in Queensland in a good soil supplied with ample moisture.

It does not attain large size—about 12 to 15 feet in height—whilst the leaves, which are broad, glossy, and handsome, fall during the winter months.

No special care by way of pruning is required, as the trees naturally form nicely-shaped heads. Some trimming may be necessary at planting, and perhaps the removal at times of an odd branch or two which tend to crowd other growths.

There are a number of kinds, some of which are of Japanese and others of wild American origin, but the Japanese varieties are the most common, and produce the finer quality fruit.

Dia-Dia-Maru is probably the best in most situations. The fruit is large and flattish in shape, almost seedless, juicy, and possesses a delicious flavour. Other good varieties are Heycheya and Kuro Kumo, which in shape are more rounded.

Under local conditions Persimmons ripen during late February, March, April, and early May. They are, therefore, somewhat subject to fruit fly attack.

The fruit should only be eaten when fully mature, i.e., when the flesh becomes soft like an unset jelly. When unripe, even though highly coloured, it has a peculiar astringent taste which is most objectionable.

Young trees should preferably be planted late in winter.

FRUIT MARKETING NOTES.

By J. H. GREGORY, Instructor in Fruit Packing.

FOR the next eight weeks or so we can expect the market prices to take short, sharp fluctuations as periods of cold or wet weather are experienced. Prices for custard apples, citrus, and fruits of a like nature are always affected by weather changes, whilst apples and other cooking fruits do not show the same tendency to price fluctuation. With the advent of larger consignments of citrus, and cooler weather, prices have eased slightly. Custard apples show the same result. It must still be borne in mind that good-quality well-packed fruit is always the first to be sold, and usually realises top market prices. Regularity of consignments should be the aim of all growers, coupled as far as possible with rotational marketing for size. "Keep on sending the larger fruit, and give the small sizes a chance to grow" is a good maxim to use.

Apples.

From now on fresh apples will become scarcer, and cold-stored fruit will supply demands. Where are the Stanthorpe Granny Smiths? Many of those growers who hurried their crops away should now be realising the mistake of picking the whole crop by the end of March. With the practice of careful rotational picking, quite a large amount should have been available for storage on the farm. Careful handling, together with the cold nights now being experienced, should enable Granny Smiths to be held and marketed satisfactorily until the end of June at much better prices than those realised during the season. Cold-storage lines of Jonathans should now be very carefully watched, and placed on the market whenever a good price is available. Regular small weekly quantities give better results than a few large haphazardly placed parcels.

Prices at the middle of May were:—Delicious, from 8s. to 10s.; Jonathan, from 5s. 6d. to 8s. 6d.; Granny Smith, from 8s. to 11s.; slightly hail-marked Granny Smith, from 6s. to 7s.

Custard Apples.

Consignments have increased in quantity and prices have eased. It is now more necessary than ever to market only matured fruit, which is indicated when the interstices are a rich creamy colour. By carefully observing this rule, no black or hard ripening custards will be placed on the market.

Brisbane prices are 3s. to 4s. per half-bushel, and Melbourne prices 5s. to 7s. per half-bushel.

Matured custards carefully packed with woodwool padding carry quite satisfactorily to Sydney and Melbourne.

Pears.

Prices for Winter Coles varied from 10s. to 13s. 6d.; for Beurre Bosc, from 6s. to 8s. 6d.; and for Keiffers, from 6s. to 8s.

Papaws.

Winter papaws will now be seen on the market. Growers should allow more colour to develop before marketing their fruit, especially in the case of Southern consignments. Tropical fruits do not have the benefit of a high humidity and sunshine to assist them in ripening when on the Southern markets. Plenty of padding around each fruit, coupled with wrapping, will give good results.

Brisbane prices:—For locals in trays, from 1s. 6d. to 4s.; in dump cases, from 3s. to 6s.; for Yarwuns, from 9s. to 10s. per tropical case.

Melbourne prices:—From 15s. to 17s. per tropical case.

Sydney prices:—10s. per tropical case.

Bananas.

Bananas have maintained their rise in price, although, owing to an increase in the percentage of smaller sizes, the quality of the fruit is not quite so good. Prices over the next few weeks should remain steady.

Brisbane prices:—Sixes, from 7s. to 9s. 6d.; Sevens, from 7s. to 11s. 6d.; Eights, from 9s. 6d. to 12s. 6d.; and Nines, from 10s. to 13s.

Melbourne prices:—Sixes, from 12s. to 13s.; Sevens, from 14s. to 15s.; Eights and Nines, from 16s. to 17s.

Sydney prices were slightly easier than Melbourne.

Pineapples.

The necessity for closely watching that green pines are not sent must again be stressed. With the advent of cool weather, the fruit can be allowed to remain longer on the plantation without increasing the risks of faulty carriage.

Brisbane prices:—Smooths, from 3s. to 6s. per dozen, and from 5s. to 8s. per case; Ripleys, from 3s. to 6s. per dozen, and from 6s. 6d. to 9s. per case.

Melbourne prices:—From 10s. to 16s. per case.

Sydney prices:—From 9s. to 13s. per case.

Passion Fruit.

Prices have eased considerably. Growers should not include crinkled fruit with the smooth, as this will affect the price of the lot.

Brisbane prices ranged from 5s. to 8s. per case, and Melbourne prices from 9s. to 18s.

Rosellas.

Rosellas are not in very popular demand on the Brisbane market. Prices received were from 2s. to 2s. 6d. per bag.

Grapes.

Cold-stored consignments are now on the market, and are in many cases faulty, particularly the Cornichons, for which prices range from 2s. to 8s.; Southern Ohanez, bringing from 8s. to 10s., are the most satisfactory at present.

Citrus.

Increasing quantities have tended to reduce prices. Growers are warned against trying to gas-colour immature fruit, as it simply cannot be done in a sufficiently satisfactory manner to make it worth while.

Benyenda lemons have been bringing from 13s. to 15s. per case. There is no doubt that the excellent pack is the reason for this fruit maintaining such high prices compared with other lines. There is no reason why other growers should not be obtaining the same prices if they put a little extra effort into their pack and get-up. Other brands at from 8s. to 10s. show great discrepancy. Lines of fruit are often seen, of which the quality is equal to anything produced, spoiled from the marketing point of view by the mixing of first and second quality. These remarks apply also to oranges, mandarins, and grapefruit. Melbourne and Sydney prices for lemons range from 6s. to 10s. 6d.

Brisbane prices for oranges are as follows:—Navels (Benyenda) from 11s. to 14s.; other Navels, from 6s. to 9s.; common oranges (Benyenda), from 8s. to 10s.; others from 5s. to 6s. Melbourne prices for Washington Navels ranged from 10s. to 13s., and for Thompson's Navels from 9s. to 10s.

Grapefruit prices in Brisbane were from 6s. to 7s. 6d., and in Melbourne from 8s. to 12s.

Mandarins in Brisbane brought from 5s. to 6s. for Fewtrells, and 5s. to 8s. for Emperors. Melbourne prices were 8s. to 10s. for Fewtrells, and 10s. to 12s. for Emperors, with some higher.

Tomatoes.

Brisbane prices for locals are:—Coloured, from 3s. to 4s. 6d.; and green, from 1s. to 3s. Stanthorpe tomatoes brought from 1s. to 2s. 6d. per case. Attention is drawn to the difference in price between coloured and green tomatoes.

General Notes.

Many growers still persist in placing lids on their cases that are too narrow, both for local markets and for country orders. Much fruit is damaged and reduced prices are realised through this foolish practice. Country-order buyers will not risk buying consignments of this type to send out, and consequently the growers' market is considerably restricted.

◆

HOME TANNING.

An American formula for home tanning of cattle hides:—Ten gallons of soft water, ½ bushel of bran, 7 lb. of salt, and 1½ pints of sulphuric acid. After the hide has been cleaned and fleshed it should be immersed in the solution for twelve hours, then washed and dried. The more the hide is stretched and worked while drying the softer and more pliable will be the finished product. Sheep pelts may be treated also, but only 1 pint of sulphuric acid should be used in the solution for pelts. [Sulphuric acid should, of course, be handled very carefully. A bucket of clean water should be kept handy, in case the acid is splashed on the hands or other parts of the user's body or clothing. Quick immersion in clean water of the affected part will prevent serious harm.—Ed.]

Agricultural Notes

THE far north coast received beneficial rains early in May, but elsewhere the falls have been light, with the exception of certain favoured areas such as Nambour, Bald Knob, and Nerang, where over 2 inches were registered.

At the time of writing (20th May) the agricultural areas are generally in need of good soaking rains to refresh pastures and all growing crops. The dry spell is being severely felt on the Darling Downs, where many stockowners have been obliged to seek agistment for their flocks and herds. Dairy farmers are utilising reserves of hay, chiefly lucerne, but as large quantities have been railed to central and western districts there is a possibility of their being insufficient remaining for local requirements. Better conditions prevail west of Dalby, where a fair winter is assured owing to the excellent summer rains. Grasses are commencing to seed along the Western line, and if handled judiciously the heavy seeding should result in a thickening up of the pastures.

The Instructor in Agriculture at Roma (Mr. C. H. Defries) states that Rhodes grass and Blue Panic are giving good results on the lighter soils, and now that natural pastures are drying off, such grasses will be very useful in providing succulent feed until winter fodder crops are available. On the Downs existing crops of feed sorghum will be very valuable, but supplies are unfortunately limited in quantity. More attention should be devoted to this crop for both silage and fodder purposes, as, unlike the grain sorghums, bird pests do not greatly affect its value as feed. Some few early-sown wheat and oat crops are holding out, but as recent rains rarely exceeded half an inch, the general sowing will depend on future seasonal falls. As there is little subsoil moisture, at least 2 inches will be required to assure a good plant.

In common with the majority of summer crops, maize will return only light yields in Southern Queensland, a fact which is reflected in the increased prices now being realised. However, conditions were very much better on the Atherton Tableland where the crop is estimated at 23,000 tons.

PLATE 254.
Looking across fields of Sorghum and Sudan grass, Coreena Station buildings in the distance.

Tobacco.

As in many of the tobacco areas the operation of grading is in full swing, opportunity is again taken to warn growers to pay more attention to this important phase of the industry. No grade should include any trace of green, as again and again buyers have refused to make a bid for lines showing traces of immature leaf.

PLATE 255.
Reaper and Binder in action on a crop of Sudan grass, Coreena Station.

Fodder cultivation and conservation is practised successfully and extensively on this western property.

Another point which cannot be too strongly stressed is the irregular grading and baling of the leaf. When a bale is submitted containing mostly fair-quality leaf, together with a percentage of other grades, the buyer immediately places a valuation upon it equal to the lowest grade in the bale, as, until the bale is fully opened, there is no guarantee as to the percentage of the respective grades. In this manner growers are losing pounds in their annual returns.

PLATE 256.

Scene on Coreena Station, where fodder crops are in regular cultivation and are chaffed and bagged for future use.

Sugar.

During May, useful rains were experienced in all cane areas except the Burdekin. Though air temperatures were too low to favour vigorous crop growth, some progress was made, and the good supply of soil moisture will keep the crop in good order.

Crop estimates to hand indicate that a very high record yield of sugar will be harvested in Queensland this year.

Cotton.

Cotton harvesting has proceeded throughout the month, and during the period rain has fallen over most of the cotton areas, generally in small amounts.

Insect damage continues to be severe, especially on the late-planted cotton, and it is not anticipated that the crop will yield as much as was previously thought.

Receivals at both ginneries are good, and the quality of the cotton is being maintained.

No frosts of sufficient intensity to kill the cotton bushes have yet been reported.

Seeds Every Farmer Should Know.

II.

(Part I. published in October, 1935.)

By F. B. COLEMAN, Officer in Charge, and R. J. HOLDSWORTH, Inspector, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

Sorghum Sudanense (Figs. 5 and 6).

Common name.—Sudan Grass.

Description.—Seed hulls shiny, colours varying dark-yellow, many of which are tinged with red, brown, and black, canary yellow, and a few in most samples brown to black. Hairs may or may not be present. Rachilla jagged appearance at top and base.

Size.—Varying from 4½ x 2½ mm. to 7 x 2 mm. and 1¼ to 2 or more mm. thick.

Caryopses (Kernels).—Dull light-brown coloured, plump.

Size.—4 x 2½ mm. and 2 mm. thick.

Occurrence.—A commercial crop of considerable value for feed and seed.

Sorghum Halepense (Figs. 7 and 8).

Common name.—Johnson Grass.

Description.—Seed hull shiny, black, sometimes brown or dark-yellow, seed slightly smaller than Sudan as a rule. Rachilla cup shaped at top and rounded at base of seed. Each rachilla, as a rule, is intact on the seed. Hairs may be present.

Size.—4 x 2 mm. and 1 mm. thick.

Caryopses (Kernels).—Dark coloured.

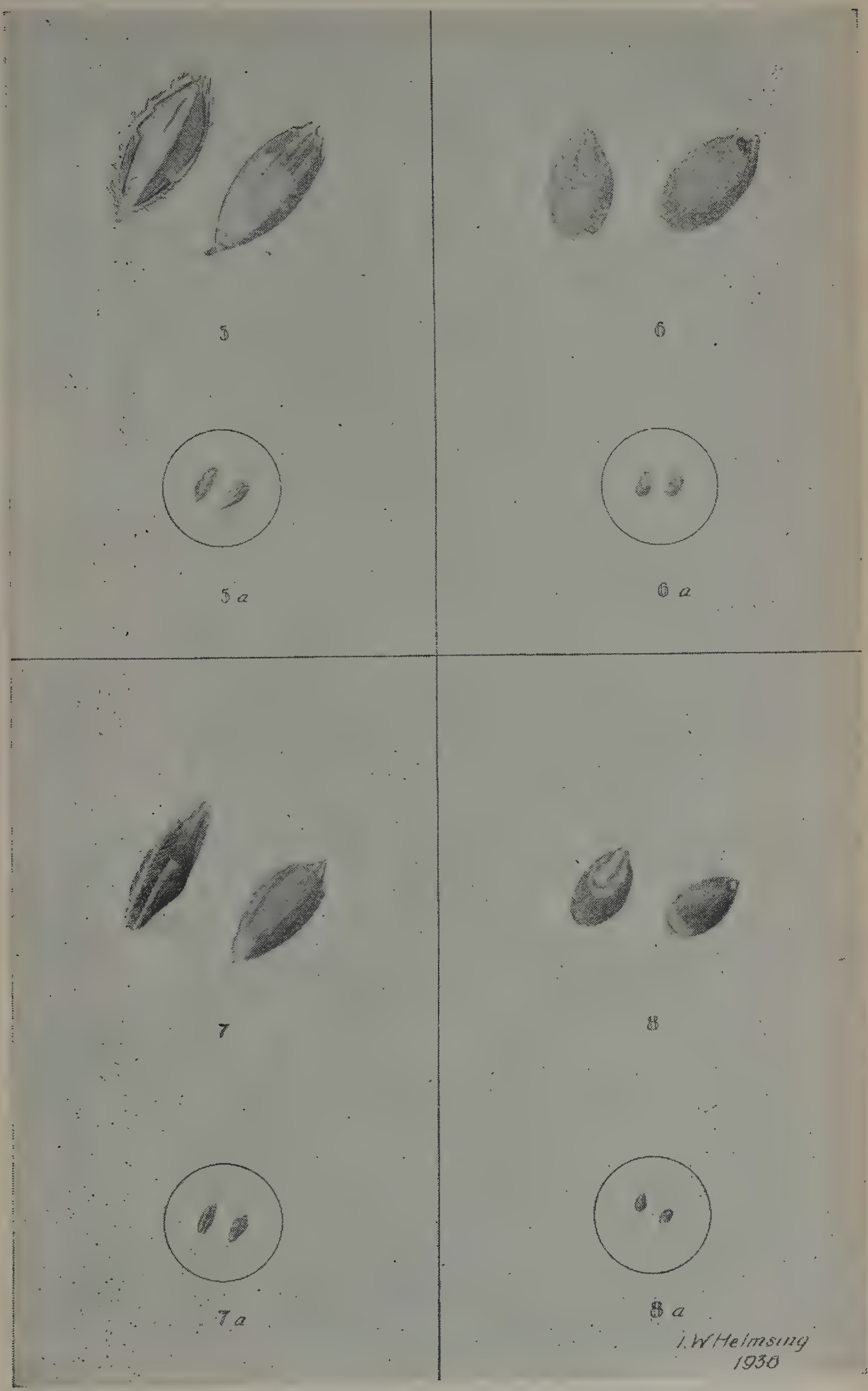
Size.—2½ x 2 and 1 to 1½ mm. thick.

Occurrence.—In Sudan grass seed; unfortunately, this impurity is found in Queensland grown seed.

Usually with Sudan grass and Johnson grass the rachillæ from which two other seeds have been broken are attached to each seed.

The suture (groove marking natural division between seed and rachilla) (Plate 258—*c*) is present only in Johnson grass, resulting in a clear cup-shaped break at the ends of these rachillæ when the seed is detached from the remainder of the plant. In Sudan, the suture being absent, a jagged fracture occurs at the base of the seed and at the apex of the rachilla.

Fig. 5. Sudan Grass x 5.
Fig. 5a. Sudan Grass, Natural size.
Fig. 6. Sudan Grass, Caryopses x 5.
Fig. 6a. Sudan Grass, Caryopses, Natural size.
Fig. 7. Johnson Grass x 5.
Fig. 7a. Johnson Grass, Natural size.
Fig. 8. Johnson Grass, Caryopses x 5.
Fig. 8a. Johnson Grass, Caryopses, Natural size.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I. W. Helmsing
1930

PLATE 257.

Many samples of commercial Sudan grass seed have suffered considerable damage in the process of thrashing and cleaning, therefore we find that the outer coat or hull is somewhat shortened; also the rachillæ (Plate 258—*c*) may be present or absent and the hairs are frequently rubbed off.

The function of the rachilla is to attach to the plant a fertile seed, to which in its turn one or more other seeds are attached.

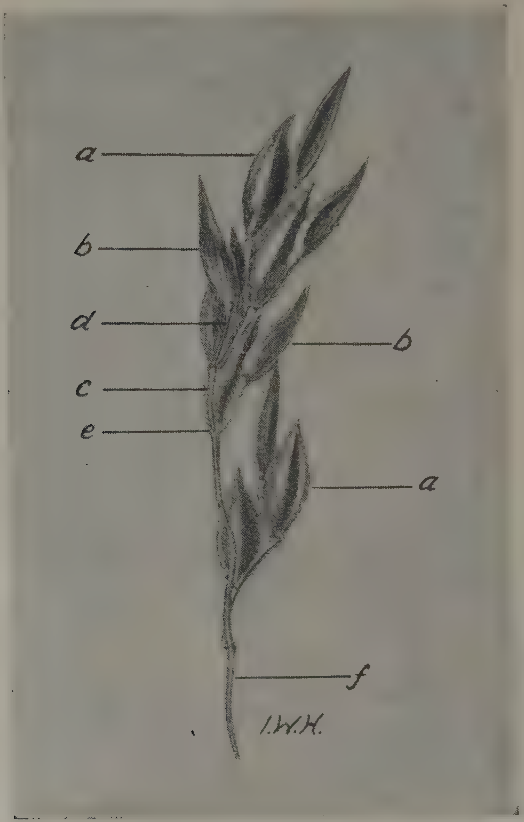


PLATE 258.

SEED CLUSTER OF JOHNSON GRASS.

a.—Fertile spikelets (seed).
b.—Sterile spikelets.
c.—Rachilla.
d.—Pedicels of sterile spikelet.
e.—Suture (groove marking a natural division).
f.—Rachis.

The attachment of each final single sterile seed of the seed cluster is called a pedicel. Normally it is impossible to tell from a single seed whether the attachments are rachillæ or pedicels but for the purpose of this article they are called rachillæ. (See Plate 258.).

It should be noted that the differences between Sudan and Johnson grass seeds are very difficult to detect with certainity, and the indentification should only be undertaken by a trained person, who in most cases

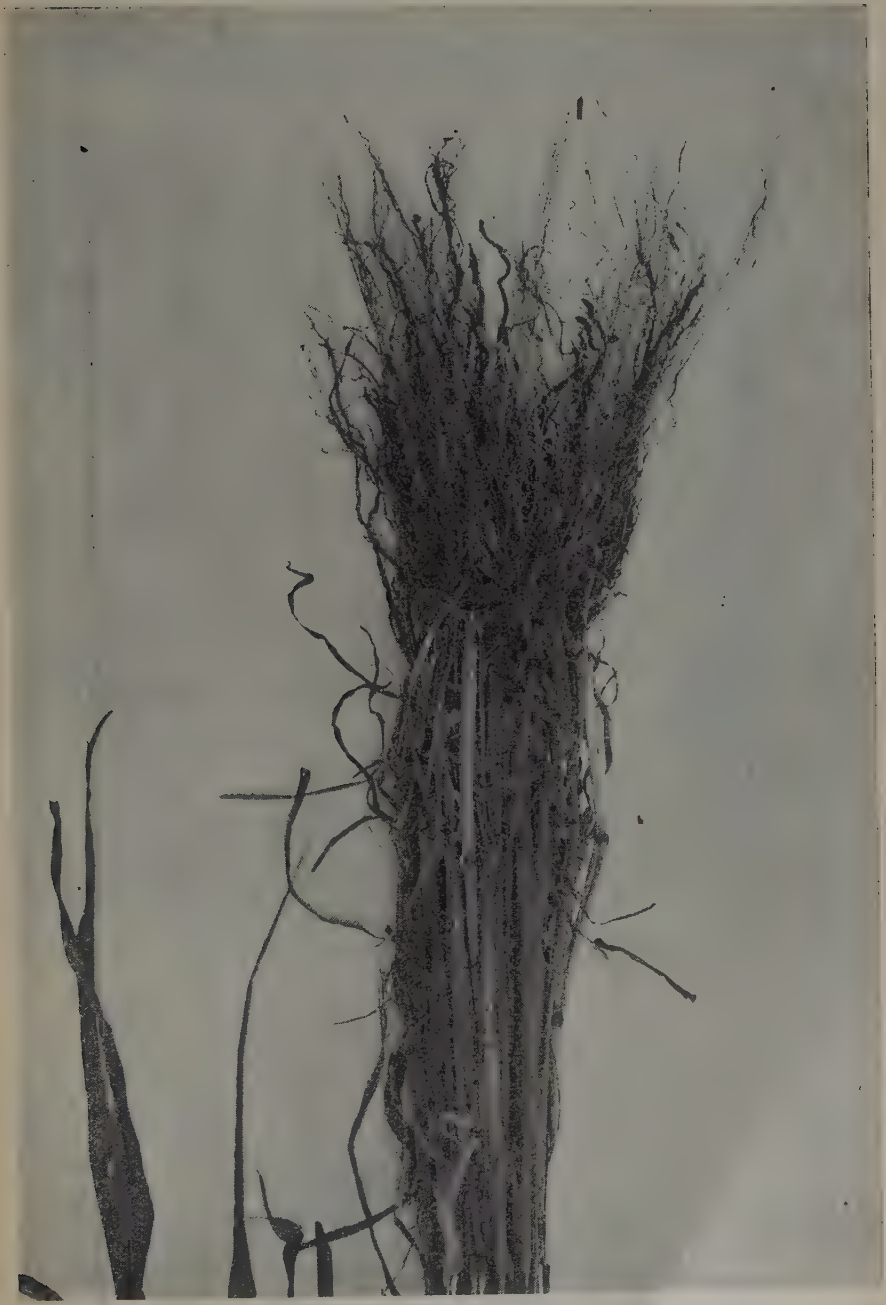


PLATE 259.

Sudan Grass showing the fibrous root system.

owing to the damage sustained by the seeds in harvesting, would not be prepared to certify as to Sudan grass samples being free of Johnson grass seeds.

The only definite means of identification exists in an examination of the root systems of the two plants, the difference being well illustrated by Plates 259 and 260.

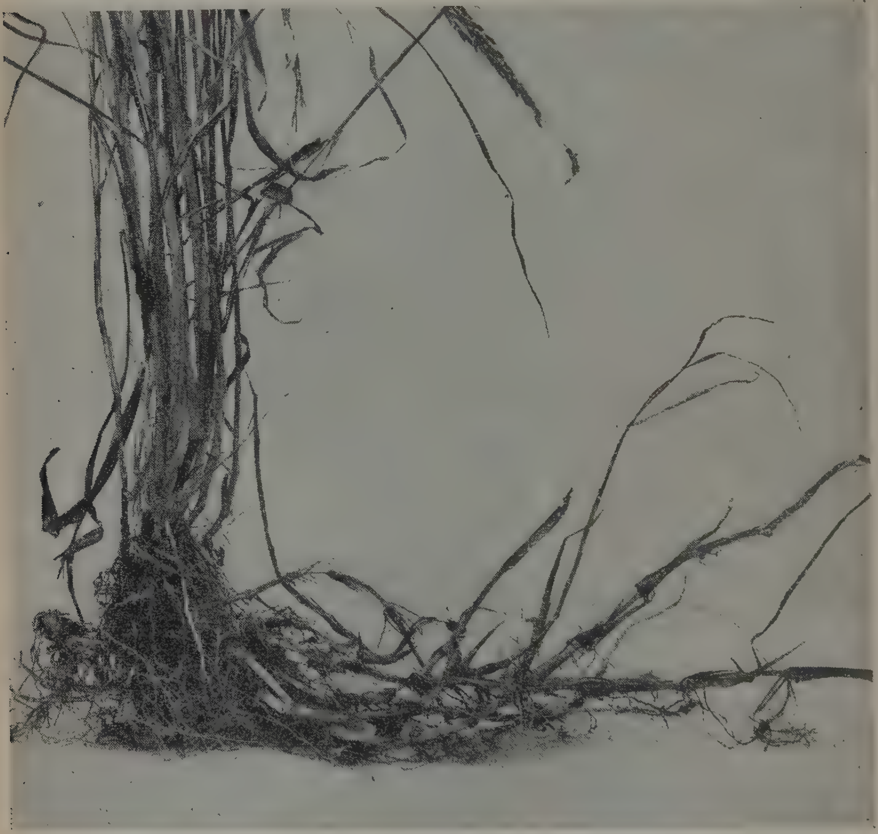


PLATE 260.

Johnson Grass showing the persistent rootstock.

Sudan has a fibrous root system and consequently the plant could easily be eliminated by cultivation, whereas the roots (*rhizomes*) of Johnson grass, a true perennial, being of a fleshy nature and extending to a considerable extent under the earth, have the ability to throw up fresh stems; cultivation only assists to spread this plant by breaking up the underground root system, the small pieces being capable of growth even when separated from the parent plant.

It is well known that the poisonous properties (due to the presence of prussic acid—HCN) of Johnson grass are far in excess of those of Sudan.

It should also be noted that its persistent root system is able to produce herbage under very dry conditions, thereby providing a dangerous feed when animals are green grass hungry.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Burch Spear Grass.

A.D. (Bundaberg)—

1. Burch spear grass (*Heteropogon contortus*). This grass is one of the commonest in Queensland. It is much relished by stock in its younger stages, and even in its old stages we have seen it in dry periods used as a coarse chaff with some success. The spear-like seeds of grass are a decided disadvantage. Generally speaking, however, stock do not care for it when it is old.
2. Red Natal Grass (*Rhynchelytrum repens*). See reply to "Sap.")

Rhodes Grass.

C.H.D. (Roma)—

Chloris virgata is commonly known as feather top, sometimes feather top Rhodes grass. The true Rhodes grass is, of course, *Chloris gayana*. *Chloris distichophylla*, the winter growing Rhodes grass, is now, we think, fairly widely spread in the State and is easily told by its wide leaves and many spikes on the head. Although Queensland-grown specimens have been examined by the Agricultural Chemist and shown to be strongly cyaniforic, we have had no reports of trouble from the grass. Stock frequently eat this prussic acid yielding species without ill effect. The condition of the animal and other factors may have an influence.

Dalby District Grasses Identified.

R.D. (Moola, via Kaimkillenbun)—

1. *Iseilema actinostachys*. Flinder's grass.
2. *Danthonia sp.* Wallaby grass.
3. *Chloris virgata*. Feather Top.
4. *Enneapogon avenaceus*. White Heads.
5. *Sporobolus pallidus*. Fairy grass.

We will always be pleased to report on grass and weed specimens at any time.

Specimens from the Central-west.

R.C.W. (Ilfracombe)—

1. *Hibiscus trionum*. Bladder ketmia. An annual species of hibiscus that is widely spread over the temperate and subtropical regions of the world. It is very common in Central-west Queensland during the summer months.
2. *Trichinium exaltatum*. A plant of the amaranth family, Amarantaceæ, common in Western Queensland, but for which we have not heard a local name. Most species of the Trichinium are generally regarded as quite good fodders.
3. *Psoralea sp.* Probably *Psoralea patents*. This and other species of *Psoralea* are sometimes called native lucerne. Other species are common in North Queensland and Northern Territory, and in some parts are looked upon as excellent fodder, particularly valuable for fattening.
4. *Andrachne decaisnei*. A plant of the family Euphorbiaceæ, very abundant in parts of the north-west and central-west, but for which we have not heard a common name. This plant possesses a prussic acid yielding glucoside, and if eaten in any quantity by hungry stock may cause considerable trouble. Ordinary paddock resting stock seem to eat many of these prussic-acid-yielding plants with impunity, although, of course, the danger is always present.
5. *Indigofera parviflora*. A native species of indigo that in recent years has spread very much in parts of the central-west and north-west. It is not known to possess any poisonous or harmful properties.

General Notes

Staff Changes and Appointments.

Messrs. R. E. Churchward, B.V.Sc., P. F. A. Hardman, B.V.Sc., M. R. Irving, B.V.Sc, J. C. J. Maunder, B.V.Sc., C. R. Mulhearn, B.V.Sc., Government Veterinary Surgeons, and F. H. S. Roberts, D.Sc., Entomologist and Parasitologist, Department of Agriculture and Stock, have been appointed also Inspectors under the Pig Industry Act.

Messrs. J. P. Reynolds, T. H. Francis, E. W. Berzinski, R. D. Rex, W. H. Mullavey, J. Noli, T. Otterspoor, G. S. Andrews, J. Frederiksen, J. D. Johnston, W. McE. Stewart, J. Groves, J. M. Pringle, W. H. Crawford, D. E. L. Crees, E. J. O'Brien, R. Johnston, P. Blain, G. Quaid, and L. E. Rossi, of the Mossman District, have been appointed honorary rangers under the Animals and Birds Acts.

Mr. E. A. Taylor, Sub-Foreman of the Mary Valley Working Plan Area, Eel Creek, via Gympie, an officer of the Forestry Department, has been appointed also an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. S. M. Powe, previously Clerk of Petty Sessions, Boonah, has been relieved of his appointment to be also Acting Inspector of Stock at that centre, and Mr. F. B. Bergin, Clerk of Petty Sessions, Boonah, has been appointed to be also Acting Inspector of Stock in place of Mr. Powe.

Constable C. F. Robson, Wallangarra, has been appointed also an Inspector under the Slaughtering Act.

Messrs. John Cunningham and Thomas Maree, junr., members of the Hambledon Mill Suppliers' Committee, via Cairns, have been appointed honorary rangers under the Animals and Birds Acts.

Northern Plywood and Veneer Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Plywood and Veneer Board for the period from 3rd May, 1936, to 2nd May, 1939. A petition on the question of whether or not the Board shall be continued may be lodged on or before the 1st June next.

Rail Rebates in Freight on Stud Boars and Sows.

Acceding to requests from the Queensland Branch of the Australian Stud Pig Breeders' Society, the Mackay District Pig and Bacon Association, and other interested breeders, the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) recently conferred with the Minister for Transport (Mr. John Dash) with a view to ascertaining the position in regard to rail rebates on the transport per rail of stud boars, and also to ascertain the possibility of making a similar concession in rail freight on transport of stud sows for breeding purposes. Mr. Dash now advises there has been a 20 per cent. rebate allowed since 1933 on the transport of boars declared on the consignment note ''for breeding purposes,'' and that he has now approved of a similar rail rebate on breeding sows similarly declared ''for breeding purposes.''

It is essential when stud boars or sows are being forwarded by rail for breeding purposes that the consignment note be endorsed accordingly by the railway official receiving the consignment, otherwise the department would have no means of determining whether the pigs were forwarded for breeding purposs or for slaughter, for it is sometimes necessary to transport individual pigs to bacon factories in crates.

These concessions should be an additional encouragement to breeders of stud pigs, and to those farmers who desire to introduce purebred boars or sows. The Railway Department should always be advised in ample time beforehand when stud pigs are to be consigned, so that suitable arrangements may be made for the quick transport of the animals to their destination.

Station-masters have been advised as to these concessions in rail freight.

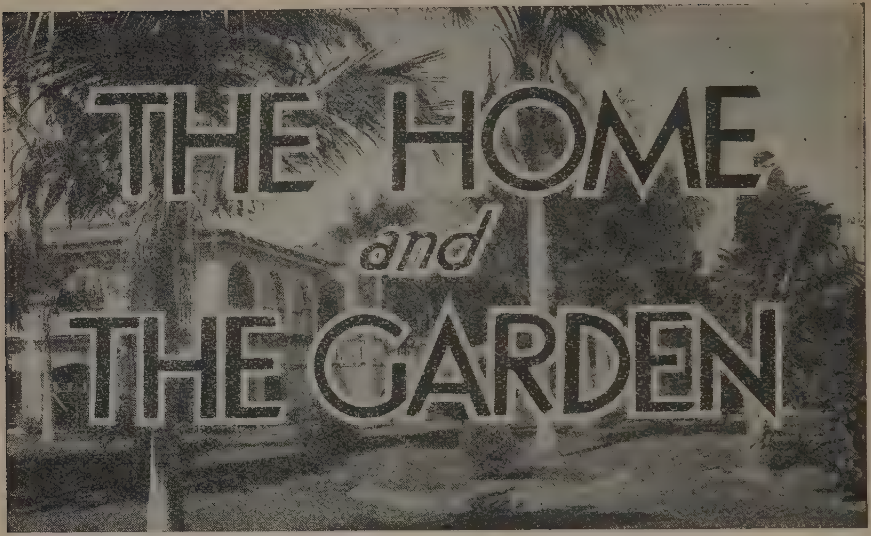
Rural Topics

Care of Farm Tools.

Carelessness in regard to farm tools, both as regards their replacement after use and their protection from atmospheric exposure during indefinite periods when they are not required, is accountable for depreciation and loss to an extent more than the average farm manager is aware. Necessary tools demand attention just as does any other part of the farm-working equipment, and their oversight should be an essential part of thorough supervision. Indeed, they should be included in every periodic machinery overhaul or treatment in preparation for between-seasons storage. A recommended method for keeping both machinery and tools free from rust and in perfect condition for their work after long intervals of disuse, is to give them a coating of beeswax, dissolved in benzol. The benzol speedily evaporates, leaving the steel or iron covered with a thin coating of the protective wax. The advantage of this treatment over the application of paint is that plough mouldboards, shovels, and hoes remain polished and ready for instant work, whereas paint and grease coverings have the effect of making soil adhere. The beeswax coating is equally effective in hot or cold weather, but as benzol is highly volatile and inflammable, the mixture should be kept in a tightly-corked bottle and kept far away from any exposed light. Where small tools, such as spanners, bits, and pliers are to be given this protective treatment, an effective method is to dip them in boiled linseed oil and let it dry on them; or the tools may be warmed on a stove and then smeared with white beeswax, after which they should be heated again to permit the wax spreading thinly and evenly over the surface to penetrate all interstices in the metal. One treatment of the metal of machinery or tools by one or other of the methods described will keep the machinery and tools rust free and bright for as long as a year, if need be.—"The Australasian."

What Is Over-run?

What is over-run? This question was asked by a bystander as a result of a teasing conversation, when a milkman was heard "joshing" a dairy farmer about the commercial use of water. "If the milk in the jug is a little blue, the housewife always suspects me," said the milk vendor. "But what about you? In every 116 tons of butter you have 14 to 16 tons of added water which costs you nothing and fetches £100 a ton." He was referring, of course, to the over-run. This is a term which every supplier of cream to a butter factory should understand. It is peculiar to the dairying industry, for the dairy farmer is paid more for the butter than is actually in the cream he supplies. The reason for this is that, during the process of churning, the butter-maker, in addition to consolidating the butter-fat in the cream supplied by the farmer, adds moisture and salt to it, which correspondingly increases the weight of the resultant butter, as compared with the butter-fat in the cream when received at the factory. That increase is defined as the over-run. In this connection the individual supplier is largely at the mercy of the factory employees, upon whose honesty and exactitude he must perforce rely. The correctness of all scales at a butter factory is an important factor in the controlling of over-run. If the weights are entered as higher than the actual quantity received, they increase the estimated manufacture and decrease the difference betwen it, and that actually manufacturd is increased. The testing of the cream for its butter-fat content is a factor equally important as that of weighing. Both these factors, weights and tests, can operate independently or together. Then losses of cream may occur after weighing, as in the case of fat loss in buttermilk, which is influenced by the size of the grain and churning temperature. The type of machinery, the temperature of the cream, the capacity of the churn, and the condition of the equipment may all play a part in the determination of the over-run. No butter can be exported or sold (legally) which contains more than 16 per cent. of moisture. Higher over-run is evidence of either lax methods at the factory or that the factory has manufactured a butter which does not comply with the legal standards.—From "Things We Talk About," by "Himi" in the "New Zealand Farmer."



OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

OUR DAILY BREAD.

FOR several thousand years civilised mankind has derived most of the energy value of its food from cereal grains. Of these wheat has for the last few centuries obtained the pre-eminence, especially among people of British race. The wheat was torn into fragments by stone rollers forming wholemeal flour, from which was prepared wholemeal bread. These contained a very large proportion of starch, a considerable proportion of vegetable protein, and three valuable vitamins. It was an excellent foundation for a healthy dietary.

If a grain of wheat is cut through, it is found to consist mostly of a white substance, which contains all the starch and nearly all the protein. At one end is a small germ of wheat embryo, which contains all the vitamins with the exception of some two of them. Surrounding the whole is a thin skin, the bran, which contains the rest of the vitamins.

About the year 1870, that is less than seventy years ago, a revolutionary change occurred through the introduction of steel rollers into the flour mills. By this process the wheat embryo was crushed, not pulverised. It and the bran were sifted out, leaving a fine white flour. This was a great commercial advantage. Wholemeal will keep for only a short time. White flour will keep for much longer, and the problem of world transportation was solved. The new flour satisfied the eye with its snow-white colour, and the fingers with its softness. The bread made from it became popular to the displacement of wholemeal bread, and everyone was pleased. It was not known that all the vitamins were absent in this white bread. They had been sifted out with the wheat-germs and the bran.

The vitamin that is most likely to be deficient in our diet as a result of this change is Vitamin B (or B1). It is true that this vitamin is present in many other foods. Some contain none at all, for instance, white flour and white bread, macaroni, rice, sago, tapioca, arrowroot, sugar, golden syrup, &c. Others contain sufficient to balance the food itself, but not to compensate the shortage in our bread—for instance, milk and potatoes. Some contain a small surplus only—for instance, oatmeal, oranges, and tomatoes (but not most fruits), cabbage, and some other vegetables (but not most vegetables). Among those foods that contain a large surplus are whole wheatmeal, peas, beans, nuts, eggs, liver, and yeast extract (marmite or vegemite). But these last are only occasional foods, not a basic food eaten daily by everybody, as was wholemeal bread before 1870. Probably most of us live somewhere near the edge of Vitamin B insufficiency, but being fortunately not within that edge (more by good luck than good management) suffer no evil consequences. Those most likely to suffer are expectant and nursing mothers, who need a double or treble allowance of this vitamin, and young children, who are often fed on excessive quantities of starchy foods and sugar.

The most obvious consequence of Vitamin B insufficiency is constipation, which has become a national disease. Huge quantities of pills, salts, vegetable and mineral oils are consumed yearly in the effort to correct this. They may do so in a clumsy and often inefficient manner, but aperients should be reserved for occasional use only and for emergencies. They are valueless in preventing the other harmful effects of the vitamin insufficiency—loss of appetite, failure of digestion, poor growth, general weakness, including heart weakness, &c.

The problem how best to prevent these effects has been a difficult one, but promises to be easier in the future. There are still a very few Queenslanders who grind their own wheat. We cannot expect many to do so. As just stated, a liberal and varied diet is a safeguard, but this from economic and other reasons is not always possible. The simplest and best solution is to restore to our bread what has been taken out of it. Some of our bakers propose to sell wholemeal bread, and so long as this is guaranteed to be made wholly from wholemeal ground with stone rollers, it can be recommended. We can recommend also a new bread made from white flour, to which has been added 10 per cent. of separately ground wheat embryo. This has been named cerevite bread. Another excellent safeguard is porridge made of whole wheatmeal, or of cerevite, which is composed of mixed cereals with the addition of 10 per cent. of wheat embryo. These foods should suffice for all ordinary purposes. In special cases or where these are not obtainable, wheat germ itself has been obtainable under the trade names of bemax and Vita B. It is now available at a much reduced price from all chemists under the name "Cerevitamin."

IN THE FARM KITCHEN.

PUDDINGS FOR COLD WEATHER.

PAY particular attention to the cooking of anything that contains suet. Now let me give you some suggestions and recipes:—When making a crust for a savoury pudding or a fruit dumpling, use half quantity of flour and half quantity of stale breadcrumbs.

If you like your savoury dishes well seasoned, add a little minced parsley and crushed herbs to ingredients for suet crust.

Always be sure to have your gravy or stock at a full rolling boil when you wish to cook suet dumplings.

Never let the water in saucepan go off the boil when steaming a sweet or savoury pudding.

Steak and Kidney Pudding.

Take 1½ lb. stewing steak, 1 lb. bones, ¾ lb. flour, pinch salt, ½ lb. ox kidney, salt and pepper, 6 oz. suet, water or stock.

Wash bones, place in a saucepan and cover with cold water. Bring to the boil and skim, then season to taste and simmer for three hours. Cut steak and kidney into small pieces, roll in flour seasoned with pepper and salt to taste. Sift flour and salt into a basin. Mix in the shredded suet, and add enough cold water to make into a stiff paste. Cut off one-third of the paste for a lid.

Roll out remainder of paste, and line a greased pudding basin with it. Put in the steak and kidney. Almost fill basin with stock from the bones, or if you do not have bones, use water. Roll out paste for lid and fix over basin, pressing the edges well together. Cover with greased paper and then with a floured pudding cloth. Tie down with string. Place basin in a saucepan of boiling water to cover, put on the lid and boil for 3½-4 hours. Enough for six to eight persons.

Sausage Pudding.

Take 1½ lb. sausage-meat, ½ lb. flour, 4 oz. suet, ½ teaspoon baking powder, ½ pint gravy or rich stock, ½ teaspoon salt, cold water.

Finely shred the suet. Add to flour sifted with salt and baking powder. Add enough cold water to make into a fairly stiff paste. Roll the pastry out on a floured board and line a deep, well-greased basin with part of it.

Mix the sausage-meat with gravy or stock.

Then turn the mixture into basin. Cover with remainder of suet crust, then with greased paper. Tie down. Place in pan with boiling water coming three-quarter way up the sides of the basin and steam for 2¾-3 hours.

Enough for six persons.

Meat Roly Poly.

Take 4 oz. shredded suet, ½ lb. liver or cold meat, 1 onion, 1 gill water, ½ lb. flour, ½ teaspoon salt, 1 gill gravy or stock.

Chop the liver or meat and onion. Mix with flour, shredded suet and salt. Moisten with the water to make a fairly stiff paste, roll lightly and shape into a roll. Lay roll on a scalded and floured pudding cloth. Roll up in cloth and secure ends tightly. Place in a saucepan of boiling water, and boil for 2 hours. When cooked, remove cloth and serve with the gravy or rich stock heated and poured over. Enough for two or three persons.

Marmalade or Jam Pudding.

Take 5 oz. jam or marmalade, 4 oz. suet, 4 oz. sugar, ½ teaspoon baking soda, 1 egg, 4 oz. breadcrumbs, 4 oz. flour, milk.

Sift flour with a pinch of salt into a basin. Mix with finely shredded suet and breadcrumbs. Add beaten egg, marmalade, and soda dissolved in a little milk. Dust a well-greased pudding basin with brown sugar. Pour in the mixture. Cover with greased paper and steam for 2 or 3 hours. Serve with heated marmalade or jam, diluted with water to taste. Enough for two or three persons.

Prune Suet Pudding.

Take ½ lb. prunes, 2 oz. mixed candied peel, ½ teaspoon baking soda, ½ lb. suet, ½ teaspoon mixed spice, 1 lb. flour, 1 egg, ½ lb. currants, ½ lb. sugar, milk to moisten.

Wash prunes in warm water and stone them, then roughly chop. Clean currants. Mix prunes, currants, flour sifted with spice and soda, and finely shredded suet together. Add sugar, chopped peel and spice. Stir in beaten egg, and enough milk to make mixture of a sticky consistency. Beat for a moment or two. Turn into a well-greased pudding basin, cover with greased paper, and steam for 2½-3 hours. Serve turned out on a hot dish, sprinkled with caster sugar. Enough for ten to twelve persons.

Apple Pudding.

Take 1½ lb. apples, ½ lb. flour, 1 teaspoon baking powder, brown sugar, 3½ oz. suet, pinch salt, milk to moisten.

Peel and slice apples. Sift flour with baking powder and a pinch of salt into a basin. Add finely shredded suet. Mix to a stiff paste with milk, roll out and line a greased pudding basin, leaving enough paste to make into a crust for top. Place a layer of sliced apples in the bottom of basin, sprinkle with sugar. Repeat layers until apples are all used. Cover with paste lid, then with greased paper, and steam for 2½-3 hours.

NOTES ON ROSE CULTURE.

The following notes on rose culture are taken from the Pacific Nurseries catalogue (Messrs. C. W. and A. C. Heers), Manly, Brisbane:—

Time for Planting.—From May until the end of September. For the coastal, excepting perhaps the Central and North, we specially recommend the later period, and, in support, advance the following reasons:—

Every horticulturist must admit that all roses, particularly in the coastal area of Queensland, invariably exhibit luxurious and succulent growth and wealth of bloom during the months of March, April, May, and early June. This being so, we contend that as the plants are full of flowing sap they are not in a fit condition for transplanting during that period. There are, however, odd seasons when plants ripen earlier. In such circumstances, we would not object to extra early planting, but consider May and June do not give the plants time to establish themselves sufficiently to withstand the approaching winter.

Roses planted during the earlier months readily respond to the warm periods which assuredly occur in the middle of our winter, only to be as surely struck by our colder and more frosty days during the latter part of the winter. This shock not only checks the growth, but actually kills the tender white jelly-like roots then in the forming. There can be only one result—a plant with stunted growth upon which the foundations of your future tree has to be built. Remember, if these plants are left undisturbed in the nursery they remain dormant.

On the other hand a thoroughly rested and ripened plant, transplanted during late July, August, or September, according to the trend of the season, is ready to break away into full and vigorous growth as the warmth of Spring appears, never to look back.

We readily admit that the rose, being a hardy plant, may even do well when planted early, but after much experience we prefer to pin our faith to late planting, in most parts of Queensland where our winter is so variable. Holding these views, we hope clients will follow our advice and plant late in the season, say, from the middle of July to the middle of September. However, from Rockhampton north, earlier planting may be preferable.

Roses planted during September and even October will do quite well; if planted this late they should, however, be provided with artificial shade and kept well watered until they are established.

It is gratifying to us to know that quite a number of clients, after acting upon our advice, write to say how pleased they are with their experience of late planting; so we reiterate—do not plant or prune roses too early in Queensland, especially along eastern slopes south of Bundaberg.

We must warn people that early planting is the cause of many failures, therefore, do not complain if you ignore our advice.

Selecting Varieties.—When making selections consult our brief descriptions and ascertain the variety's suitableness regarding its growth, style, colour, fragrance, and freedom of bloom. If you are not acquainted with the various varieties listed it will pay you to leave selection to us, mentioning any varieties you may already have. You will find a special list on the inside of the front cover, giving our choice in each colour.

Planting.—Roses should never be planted when the ground is sodden, as the soil glues together and excludes the air so necessary for the future welfare of the plant. Rather delay planting, and in the meantime bury the whole plant lengthwise, cover completely with soil and await more favourable conditions. It is surprising how long plants may be kept by this method.

Although roses do well under almost any condition, it will always repay you to trench and drain the ground. However, should the ground be flat and unsuitable for drainage, it is better to dig it a foot deep and raise the bed. Such beds require hardwood or concrete borders, otherwise the outside plants dry out too easily. Work in a liberal supply of well-rotted cow or stable manure. This work should be done at least four weeks prior to planting. Plant so that the union will be just under the surface of the ground. In the case of light sandy soil it is an advantage to have the union as much as 2 inches below the surface. Never, on any account, place fresh manure or any form of fertilizer near the roots at the time of planting.

The roots should be evenly spread and so arranged as to give them a downward tendency; cover with about 3 inches of fine soil and press down firmly; fill in and give a liberal supply of clean water. Keep the earth away from the graft until the plant strikes; in the meantime, mulch with straw in order to protect union and keep the soil from caking. Cover the outside edges of straw with soil to keep it in position.

The mulch also creates an ideal condition for further waterings. Should the weather continue dry, it will be necessary to water at intervals, according to the conditions. Do not use fresh manure or artificial fertilizer near the roots when planting. Should the sun's rays become hot after planting, it is advisable to provide the plant with artificial shade.

Suckers.—Always keep a sharp lookout for brier suckers, which may from time to time sprout from below the graft. These are readily detected by their foliage, and if not removed they will in time kill the rose tree. *However, on no account must any new rose growth from the base be interfered with.*

Manuring.—Roses should be heavily manured at least once a year, well-rotted animal manure being the best. It should be spread over the bed and lightly forked in. Bone dust and other suitable fertilizers are also beneficial. Established rose trees are greedy feeders, and periodical light dressings of fertilizer, applied during damp weather, will give good results. Heavy soil needs occasional dressings of lime, which, however, should not be used within a month or so of fertilizers.

Pruning.—There is no phase of rose culture more difficult to impart than that of pruning. After accepting the broad principles generally laid down, make a close study of the habits and peculiarities of the various types of roses. Apply commonsense methods and observe and profit by the results obtained. We are opposed to early pruning in this State for similar reasons to those advanced against early planting. However, varieties with H.P. strain may, if the canes are sufficiently ripened, be shortened during March or April to from 3 to 5 feet from the ground—the weaker the shorter. This will ensure a wealth of bloom in the late autumn. For the annual overhaul the end of July and August is the best time. Hard pruning, as practised in cold countries, must not be generally applied here. The reason is not far to seek, as the periods of inactivity are short and uncertain. Make the prevailing conditions your guide as to how and when to prune. Assist the pruning problem by observing the following golden rules during the entire season:—

(1) Cut away dead, spindle wood; (2) always cut blooms and stems that have bloomed well back to a strong eye; (3) never allow seed pods to form on the bush. By these means you will encourage correct growth and freedom of bloom. There are odd varieties which resent the knife, Penelope for instance.

It is most important that plants be kept free from scale and other diseases, otherwise valuable portions have to be prematurely removed to the detriment of the plant. Exhibitors should prune harder than those growing for general purposes. Tea roses require lighter treatment than H.T.'s and H.P.'s.

To prune, cut away all dead, diseased, and spindling wood; thin out anything that is liable to crowd; cut back shoots to a strong eye, pointing outward in the case of uprights and inward on those of spreading habits; preserve any new strong shoots coming from the base (often misnamed water shoots) that may serve to replace any worn-out stems that should be renewed every three years or so.

As soon as the new growth appears, carefully rub off any shoot that is likely to overcrowd or grow in a wrong direction.

Climbers should be allowed their fling during the time they are establishing themselves. Train the strongest canes horizontally, about 24 inches apart, shorten the ends, and cut away all other wood. Provide for the renewal of these trailers every few years.

Aphis.—Nicotine sprays, such as Black Leaf Forty, are most effective. They may be kept in check by applying the hose freely.

Scale.—Spray with either red oil, kerosene emulsion, or any lime-sulphur mixture. Many roses are lost annually through scale.

Grubs, &c.—For all leaf, plant, and flower eating insects, spray with arsenate of lead as directed.

Mildew.—This is a stubborn fungus disease that has for many years past baffled our scientists. The rose, like all other life, no doubt requires a properly balanced food, and as analyses show that our soils are often deficient in potash and lime, it is not altogether surprising to find that, where good dressings of wood ashes have been applied, appreciable improvement in reducing the mildew scourge is apparent. Experiments are being conducted all over the world in search for a cure for mildew, and reports to hand show that potash used in its various forms gives results which are at least reassuring. For our part we can say that we have found the use of wood ashes, also spent carbide, beneficial. If these are not available, try giving each established tree say 4 to 6 oz. of sulphate of potash, in addition to lime, and observe the result.

Regular sprayings with liver of sulphur (1 oz. to 2 gallons of water), or 1 oz. bicarbonate of soda to 1 gallon of water, or Bordeaux will ward off attacks. Remedies: Flowers of sulphur, 9 parts; arsenate of lead, 1 part; well mixed; applied with a bellows when the dew is on the foliage. Sprays: Sulphuric acid, 1 part to 800 parts of rain water, 1 oz. bicarbonate of soda to 1 gallon of rain water is a helpful spray. A drastic remedy is 2 tablespoonfuls of lysol to 1 gallon of water. Spraying should be done before noon. Always treat the underneath as well as the top of the foliage.

Failures.—Failures are generally attributable to one or more of the following causes:—

Having used fresh manures or fertilizer at time of planting. Allowing roots to be exposed after unwrapping. Lack of drainage or planting in soggy ground through excessive wet weather. Planting too near the edge of raised beds, too near shrubs, trees, and/or hedges; also in shady positions. Allowing plants to dry out after westerlies. Giving too much water during first fourteen days in cold weather. Heavy frosts just after planting or even when the plant is established. Planting too deep, planting too shallow, or planting too loose. Acidity in damp or poorly prepared soils. Chemical reactions from fertilizers previously applied to the soil. Plants being knocked by children or the thoughtless gardener. Dogs and cats are often the cause of plants dying or being damaged. The use of strong soap suds, &c. Planting too early or too late. Planting in same spot where a rose has been growing unless soil has been replaced.

QUEENSLAND SHOW DATES.

June.

Childers, 1 and 2.
Bundaberg, 4 to 6.
Lowood, 5 and 6.
Boonah, 10 and 11.
Gladstone, 10 and 11.
Esk, 12 and 13.
Rockhampton, 23 to 27.
Laidley, 24 and 25.
Marburg, 27 to 29.
Mackay, 30 June and 1 and 2 July.

July.

Proserpine, 3 and 4.
Kilcoy, 2 and 3.
Bowen, 8 and 9.
Townsville, 14 to 16.
Cleveland, 10 and 11.
Ayr, 10 and 11.
Rosewood, 10 and 11.
Nambour, 16 to 18.
Charters Towers, 21 and 23.
Cairns, 21 to 23.
Maleny, 23 and 24.
Atherton, 28 and 29.
Gatton, 29 and 30.
Caboolture 31 July and 1 August.

August.

Barcaldine, 4 and 5.
Pine Rivers, 7 and 8.
Royal National, 17 to 22.
Home Hill, 28 and 29.

September.

Tully, 11 and 12.
Innisfail, 18 and 19.
Malanda, 30 September and 1 October.
Southport, 26.
Imbil, 4 and 5.
Pomona, 11 and 12.
Beenleigh, 18 and 19.

Orchard Notes

JULY.

THE COASTAL DISTRICTS.

THE marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards perscribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated, do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated; but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description for the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentyful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing, well-packed boxes always realising a much higher price than indifferently packed ones on the local market.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JULY is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is under-sized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes

JULY.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinary cuttings should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

PLATE 261.
Rain forest, Lower Coomera, below the big falls.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935 AND 1936, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Apr.	No. of Years' Records.	Apr., 1936.	Apr., 1935.
North Coast.	In.		In.	In.
Atherton	4·31	35	4·55	3·23
Cairns	11·40	54	9·15	3·41
Cardwell	8·83	64	11·06	4·37
Cooktown	8·72	60	18·66	2·45
Herberton	3·86	50	2·67	2·00
Ingham	7·65	44	7·02	3·99
Innisfail	20·10	55	19·10	9·47
Mossman Mill ..	8·57	22	5·54	4·68
Townsville	3·40	65	2·16	0·47
Central Coast.				
Ayr	2·49	49	2·52	1·05
Bowen	2·73	65	0·26	1·73
Charters Towers ..	1·51	54	1·70	..
Mackay	6·27	65	0·65	3·17
Proserpine	5·91	33	2·04	7·76
St. Lawrence ..	2·80	65	..	0·43
South Coast.				
Biggenden	2·23	37	0·84	1·31
Bundaberg	3·36	53	0·93	7·04
Brisbane	3·81	85	0·21	3·62
Caboolture	4·65	49	0·58	4·23
Childers	2·92	41	1·20	2·77
Crohamhurst	6·95	42	2·64	4·82
Esk	3·10	49	0·31	2·22
Gayndah	1·48	65	0·25	0·74
Gympie	3·53	66	1·14	4·30
Kilkivan	2·32	57	0·18	2·03
Maryborough ..	3·92	65	1·42	6·35
Nambour	6·41	40	2·66	6·12
Nanango	2·01	54	0·32	1·61
Rockhampton ..	2·58	65	0·20	0·75
Woodford	4·79	49	0·64	3·99

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Apr.	No. of Years' Records.	Apr., 1936.	Apr., 1935.
Central Highlands.	In.		In.	In.
Clermont	1·61	65	..	..
Gindie	1·22	36	..	..
Springsure	1·57	67	..	..
Darling Downs.				
Dalby	1·42	66	0·13	1·16
Emu Vale	1·44	40	0·42	0·76
Hermitage	1·50	29	..	0·68
Jimbour	1·42	48	0·05	1·32
Miles	1·49	51	0·26	0·22
Stanthorpe	1·79	63	0·64	1·06
Toowoomba ..	2·68	64	0·68	3·86
Warwick	1·68	71	0·47	1·77
Maranoa.				
Roma	1·33	62	0·02	0·01
State Farms, &c.				
Bungeworgorai ..	1·25	21	..	0·09
Gatton College ..	1·97	36	0·34	1·64
Kairi	4·31	21	..	1·40
Mackay Sugar Experiment Station	4·88	38	0·21	2·80

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—APRIL, 1936.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Means at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·85	83	69	86	9	61	18	1,866	17
Herberton	..	73	61	80	19	51	19, 20	267	13
Rockhampton	30·04	83	62	89	18	52	22, 23	20	3
Brisbane	30·10	78	59	84	26	50	20	21	6
Darling Downs.									
Dalby	30·08	79	51	86	4	37	20	13	2
Stanthorpe	..	71	45	82	4	27	20	64	4
Toowoomba	..	74	51	80	17	37	22	68	4
Mid-Interior.									
Georgetown	29·90	88	67	92	25	59	17, 20	156	4
Longreach	30·03	85	56	91	18	45	21	48	2
Mitchell	30·08	80	45	85	1, 18, 7	34	20	2	1
Western									
Burketown	29·90	89	69	94	26	62	16	45	2
Boulia	30·02	85	60	94	1	50	21	..	..
Thargomindah	30·09	80	55	94	1, 3	43	20		

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	June 1936.		July. 1936.		MOONRISE. June, 1936.	MOONRISE. July. 1936.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·37	5·2	6·45	5·7	2·7	2·1
2	6·37	5·2	6·45	5·7	2·45	2·49
3	6·38	5·2	6·45	5·7	3·23	3·43
4	6·38	5·2	6·45	5·8	4·8	4·40
5	6·39	5·2	6·45	5·8	4·58	5·40
6	6·39	5·2	6·45	5·8	5·52	6·43
7	6·39	5·2	6·45	5·9	6·49	7·45
8	6·40	5·2	6·45	5·9	7·51	8·47
9	6·40	5·3	6·44	5·9	8·51	9·50
10	6·40	5·3	6·44	5·10	9·54	10·53
11	6·41	5·3	6·44	5·10	10·55	11·57
12	6·41	5·3	6·44	5·11	11·57	a.m.
13	6·41	5·3	6·43	5·11	..	1·3
					a.m.	..
14	6·42	5·3	6·43	5·12	12·57	2·8
15	6·42	5·3	6·43	5·12	2·4	3·12
16	6·42	5·3	6·43	5·13	3·12	4·13
17	6·43	5·4	6·42	5·13	4·10	5·11
18	6·43	5·4	6·42	5·14	5·27	6·6
19	6·43	5·4	6·42	5·14	6·25	6·48
20	6·43	5·4	6·41	5·15	7·22	7·31
21	6·44	5·4	6·41	5·15	8·11	8·1
22	6·44	5·4	6·41	5·16	8·54	8·34
23	6·44	5·4	6·40	5·16	9·31	9·6
24	6·44	5·4	6·40	5·17	10·5	9·36
25	6·44	5·5	6·39	5·17	10·35	10·7
26	6·45	5·5	6·38	5·18	11·6	10.40
27	6·45	5·5	6·38	5·18	11·36	11.17
					p.m.	
28	6·45	5·5	6·37	5·19	12·7	11·55
						p.m.
29	6·45	5·5	6·36	5·19	12·42	12·41
30	6·45	5·5	6·36	5·20	1·19	1·32
31			6·35	5·21		2·27

Phases of the Moon, Occultations, &c.

5 June,	○	Full Moon	3 22 p.m.
12 ,,	☽	Last Quarter	10 5 p.m.
7 ,,	●	New Moon	3 14 p.m.
19 ,,	☾	First Quarter	5 22 a m.

Perigee, 16th June, at 7 a.m.
Apogee, 28th June, at 6.36 a.m.

On the 19th at 3 o'clock in the afternoon the Sun will be undergoing an eclipse which will be total in Asia and the most southern part of Europe. In Hongkong it will be almost total, but only about half its face will be covered by the Moon in the British Isles, where, however, a very fine sight will be afforded if the sky is clear. The eclipse will be in progress about 2 hours before sunset at Brisbane, where it will be entirely invisible. Throughout India the eclipse will end about 3 o'clock. The nearest place to Australia at which a glimpse of it will be seen is in the Philippine Islands.

On the 20th at 2 p.m. Venus will be within half a degree (only the diameter of the Moon) from Mars. Venus in its more rapid motion will overtake Mars and pass to the eastward of it.

At midday on the 22nd the Sun will reach its furthest declination northward, and the phenomenon of the summer solstice will take place in the northern hemisphere. After this the Sun will begin to return southwards.

On the 25th Mercury will reach its greatest declination, 22 degrees westward of the Sun, and set 1 hour 24 minutes before it, and rise 1 hour 44 minutes before the Sun.

On the 29th Venus will be in superior conjunction with the Sun and therefore unobservable, being almost in a straight line from the Earth beyond the Sun.

Mercury sets at 5.5 p.m., 3 minutes after the Sun, on the 1st; on the 15th it rises at 5.14 a.m., 1 hour 28 minutes before the Sun, and sets at 4.1, 1 hour 2 minutes before it.

Venus rises at 6 a.m., 37 minutes before the Sun, on the 1st, and at 6.24 a.m., 18 minutes before the Sun, on the 15th.

Mars rises at 6.50 a.m., 23 minutes after the Sun, on the 1st, and at 6.8 a.m., 34 minutes before the Sun, on the 15th.

Jupiter rises at 5.40 p.m. and sets at 7.29 a.m. on the 1st; on the 15th it rises at 4.38 p.m. and sets at 6.25 a.m.

Saturn rises at 12.34 a.m. and sets at 12.59 p.m. on the 1st; on the 15th it rises at 11.52 a.m. and sets at 12.7 p.m.

The Southern Cross will be at its highest position XII. about 8 p.m. on the 1st and 6 p.m. on the 30th, when it will be 27½ degrees above the horizon at Brisbane, but only 19 degrees at Townsville.

5 July	○	Full Moon	3 22 p.m.
12 ,,	☽	Last Quarter	10 5 p.m.
19 ,,	●	New Moon	3 14 p.m.
27 ,,	☾	First Quarter	5 22 a.m.

Perigee, 16th July, at 7 a.m.
Apogee, 28th July, at 6·36 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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